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Southern Medical Journal

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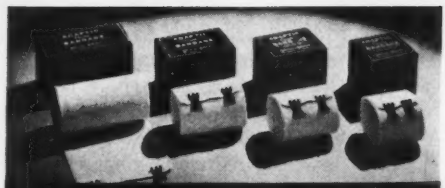

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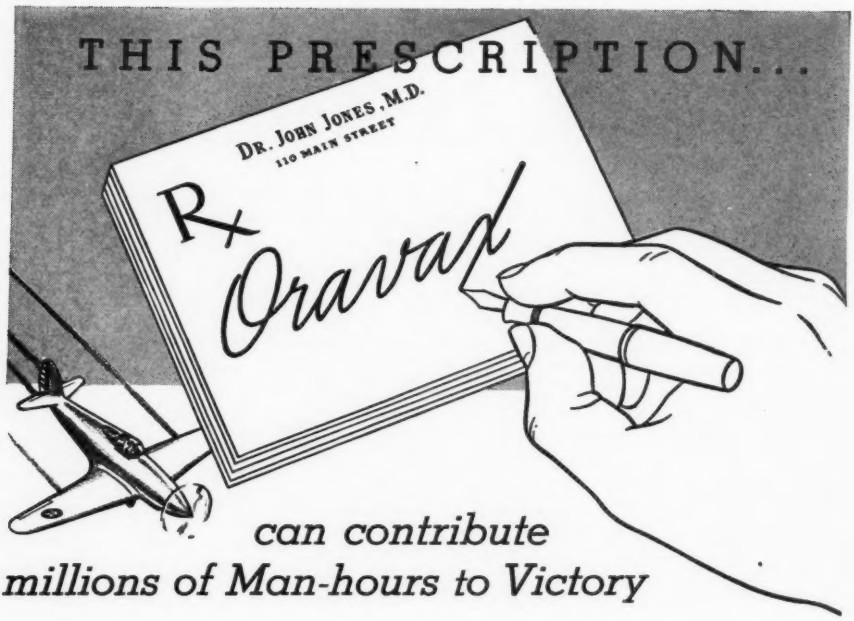

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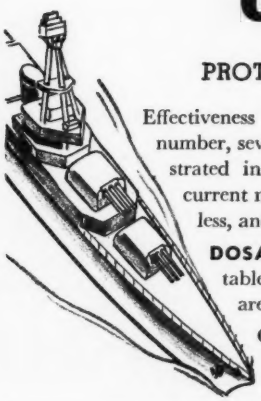

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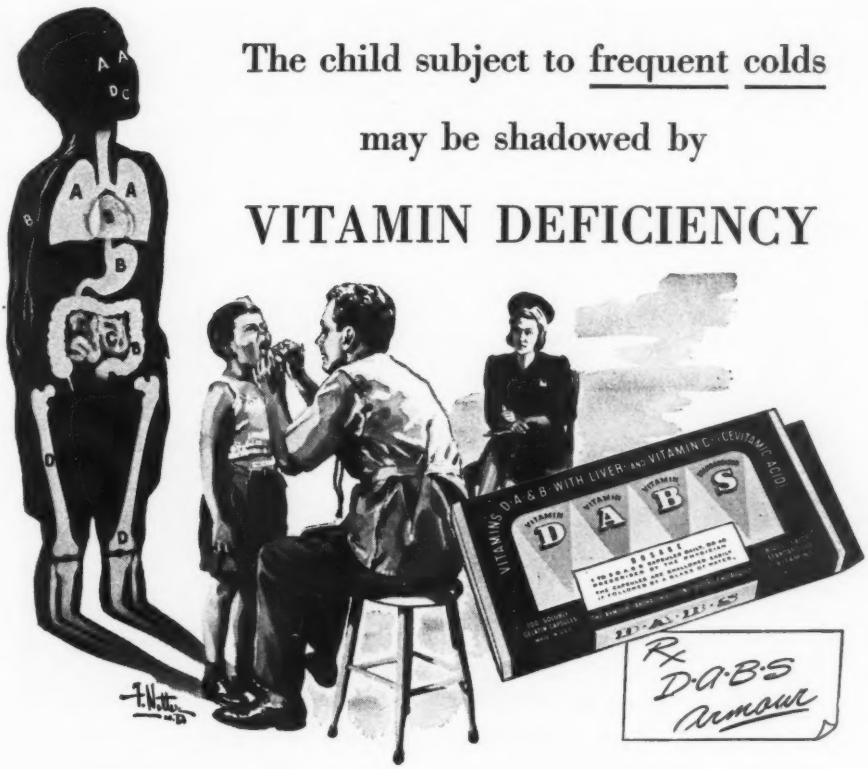

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(1) *McLester, J. S.; J. A. M. A., 112:2110 (May 27, 1939)*

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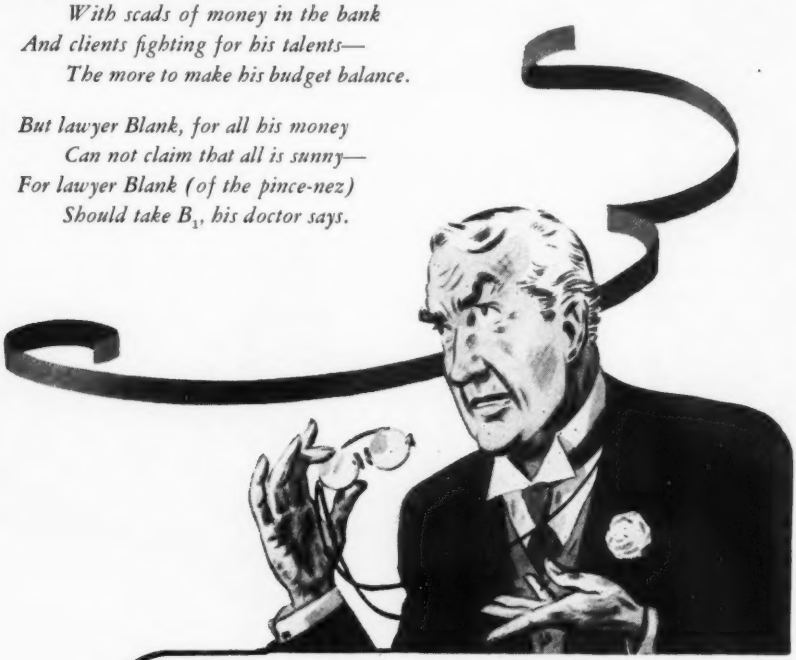

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[1]Reimann, H. A.: Treatment in General Medicine, 1941 Progress Volume. Phila., F. A. Davis Co., 1941.
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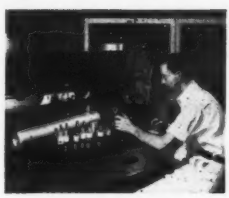

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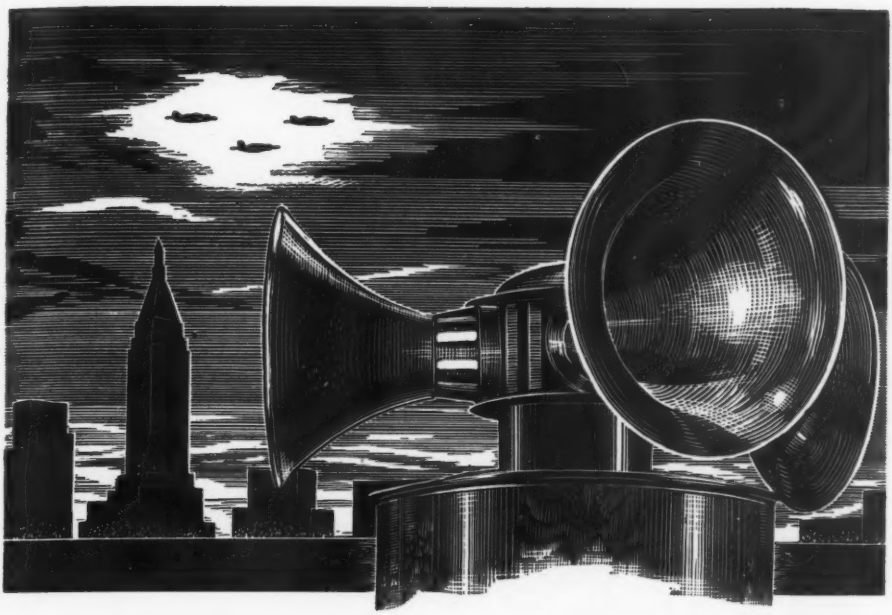

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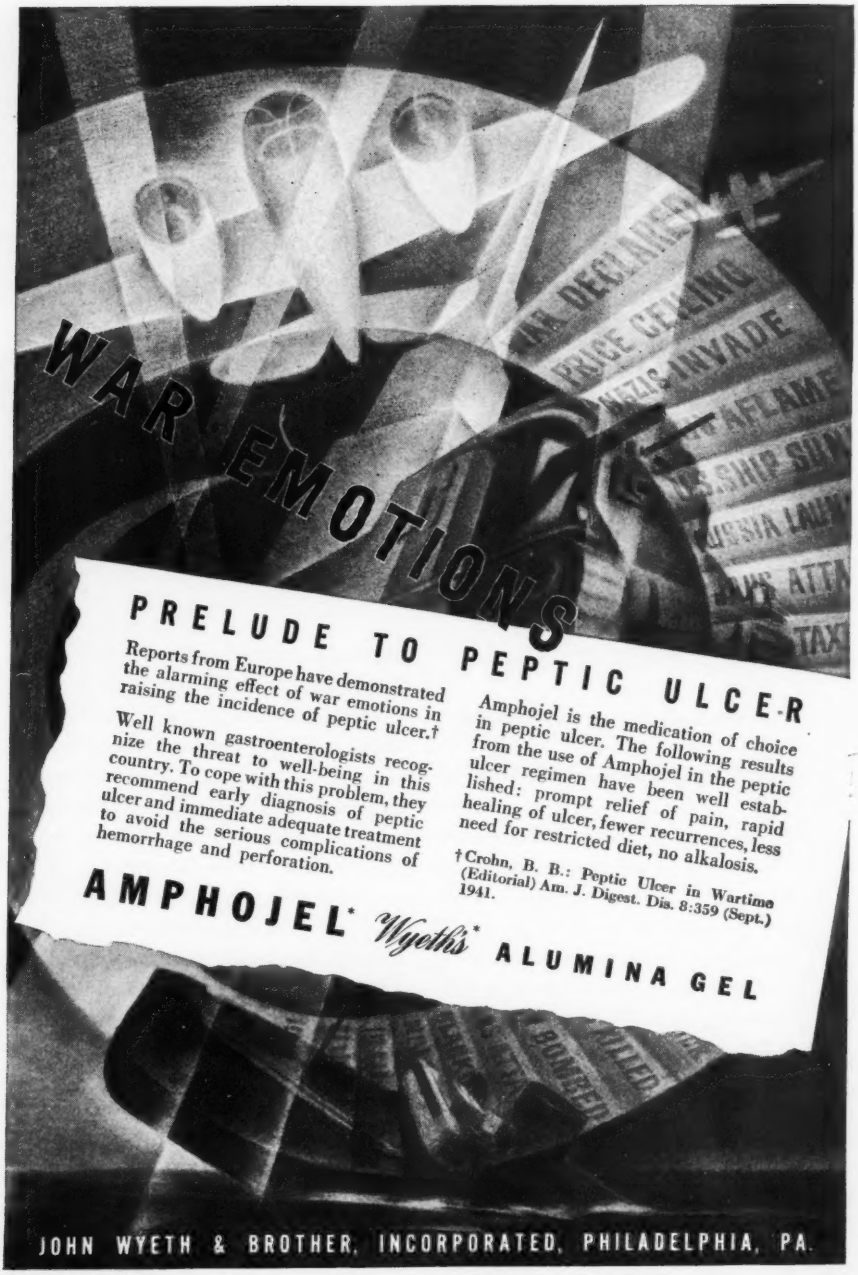
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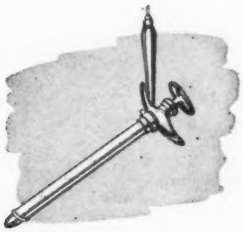

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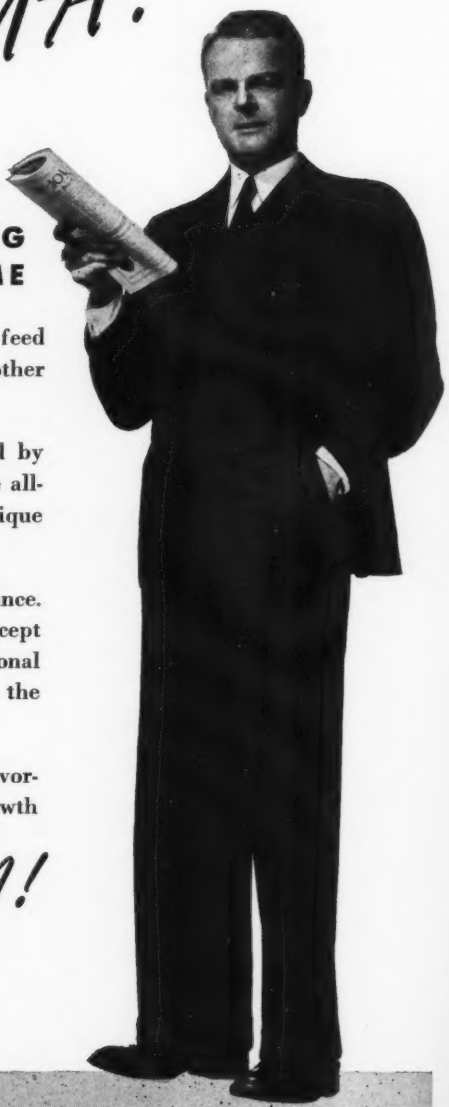
IN INFANT FEEDING ...IT SAVES MY TIME



- Directions on how to mix and feed S-M-A can be explained to the mother and nurse in two minutes.
- S-M-A is more easily digested by the normal infant because of the all-lactose carbohydrate and the unique S-M-A fat.
- With S-M-A nothing is left to chance. All the vitamin requirements, except ascorbic acid, together with additional iron are included in S-M-A in the proper balance, ready to feed.
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*S-M-A, a trade mark of S.M.A. Corporation, for its brand of food especially prepared for infant feeding—derived from tuberculin-tested cow's milk, the fat of which is replaced by animal and vegetable fats, including biologically tested cod liver oil, with the addition of milk sugar and potassium chloride; altogether forming an antirachitic food. When diluted according to directions, it is essentially similar to human milk in percentages of protein, fat, carbohydrate and ash, in chemical constants of the fat and physical properties.

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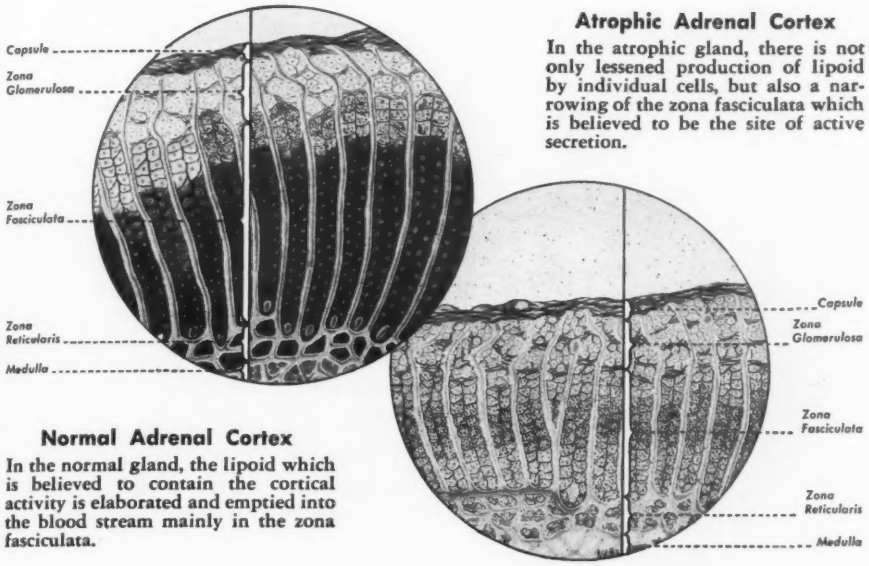
HORMONES of the ADRENAL CORTEX



Atrophic Adrenal Cortex

In the atrophic gland, there is not only lessened production of lipoid by individual cells, but also a narrowing of the zona fasciculata which is believed to be the site of active secretion.

Normal Adrenal Cortex

In the normal gland, the lipoid which is believed to contain the cortical activity is elaborated and emptied into the blood stream mainly in the zona fasciculata.

Sterile Solution Adrenal Cortex Extract (Upjohn)

Sterile Solution Adrenal Cortex Extract (Upjohn) is an extract of adrenal glands from domestic animals, containing the cortical steroids essential for the maintenance of life in adrenalectomized animals, but so purified that only traces, at the most, of epinephrine are present. Each cc. contains not less than 50 dog units of cortical activity (2.5 rat units) when assayed by the method of Cartland and Kuizenga (American Journal of Physiology 117:678, 1936).

Sterile Solution Adrenal Cortex Extract (Upjohn) is of value in cases of Addison's disease or of adrenal cortex insufficiency, and in surgical procedures involving the adrenal gland, such as removal of cortical tumors, as a prophylactic measure to prevent the development of symptoms of adrenal cortex insufficiency.

Adrenal Cortex Extract (Upjohn) is supplied in 10 cc. size rubber-capped vials as a sterile solution for injection.

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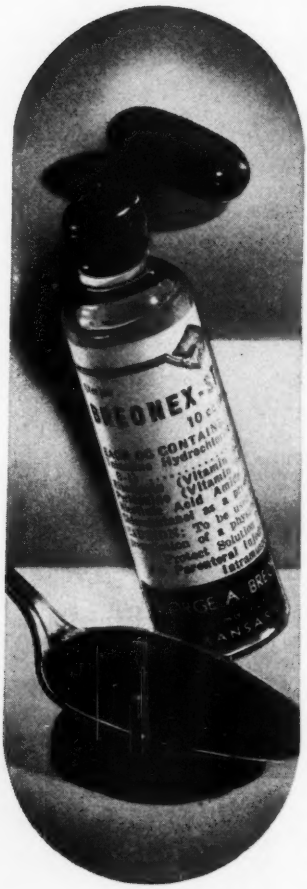
Member of Civilian Defense



Fatigued, listless patients with ill-defined symptoms involving the nerves and general metabolism have been less of a problem since the coming of vitamin B complex. Boon that the complex has been to physician and patient, it is likely that it will be even more valuable under the stress of war.

Workers from city and farm are being drawn to munition plants. Some live in trailers; others drive 20 to 30 miles to day or night shifts, skipping breakfast to save time. Nutritionists warn that these conditions, with unbalanced diets, general with some classes, bring real concern over increased subacute deficiency diseases.

Proper diet is the best correction. But when this is impracticable it is fortunate that we have the concentrated essentials in vitamin B complex. Thus Vitamin B Complex-Breon may be said to be a member of Civilian Defense. It comes in these forms:

BECAPLETS

From yeast powder, fortified to contain thiamine hydrochloride (B-1) 1 mg., riboflavin (B-2) 1 mg., pyridoxine (B-6) 0.03 mg., and nicotinamide 6 mg.

BECAPLETS WITH ASCORBIC ACID

The same components as Becaplets, with the addition of ascorbic acid (Vitamin C) 25 mg. Both are in bottles of 100, 500, and 1000.

BREONEX-STRONGER SOLUTION (FOR INJECTION)

For use when rapid and certain absorption is required. In 2 cc size ampuls and 10 cc size rubber-capped vials.

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An extract from rice bran augmented with pure principles. The syrup is particularly adapted for children. In 3-ounce and 1-pint bottles.

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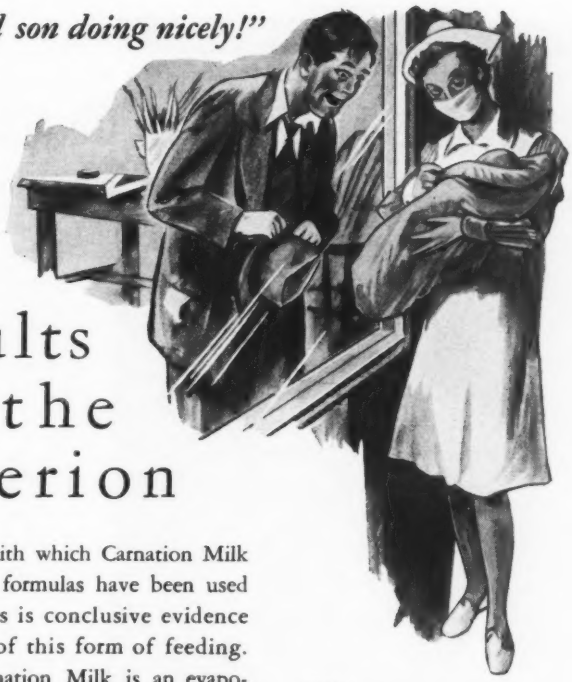

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Because it offers sound basic nutrition, Horlick's Fortified is valuable as a supplementary food for the pre-school or school child, providing elements needed to satisfy the heavy demands of growth and energy expenditure.

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Prepare—with water — or with milk.

Convenient—palatable—easily digested.

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Growing children who do not like or tire of plain cow's milk often take readily to Horlick's.

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The *Complete* Malted Milk—Not Just a Malt Flavoring for Milk.

*Jeans, P. C.: Nebr. S.M.Jl., "Newer Developments in Child Nutrition": 24:92-96, Mar. 1939.

HORLICK'S

Come and get it!

• Look at him go! First in any chow line, this rookie's enthusiastic gorging is offset, fortunately, by a strenuous program of exercise. His counterpart among the "Rocking Chair Brigade" still has to be considered. When over-indulgence and lack of exercise are causative factors in constipation, relief may often be obtained with Petrogalar.*

It helps to soften thoroughly the stool and encourages regular, comfortable bowel movement. Petrogalar is acceptable even with "stuffy" patients because of its pleasant taste and ready miscibility in water.

It may be taken directly from the spoon or from a glass. Consider Petrogalar for the treatment of constipation.

FOR THE TREATMENT OF CONSTIPATION

—Petrogalar—

*Reg. U. S. Pat. Off. Petrogalar is an aqueous suspension of pure mineral oil each 100 cc. of which contains 65 cc. pure mineral oil suspended in an aqueous jelly containing agar and acacia.

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BACTERIOLOGIC WARFARE?

● Bacteriologic warfare appears impractical at present, since it is doubtful whether it could increase *existing* problems of defense against pathogenic organisms.

One such current problem affecting our *war effort* is that of defense against the common cold which annually deprives industry of at least 45 million man-days of work—a loss equivalent to the full-time labor of 150,000 persons.[1] In fact, colds are responsible for about half of *all* work-time lost in war industries as a result of illness.

Fortunately, the incidence and severity of the common cold may now be reduced by means of 'Vacagen' Oral Cold Vaccine Tablets.

Since colds may be caused by viruses, bacteria, or a combination of both agents,[2] and immunologic response to the so-called cold virus is relatively transient, protective measures are directed towards active immunization against specific bacteria associated with severe types of coryza. Oral administration of the water-soluble antigenic factors of these bacteria has proved to be an effective means of establishing immunity from them.

• • •

Each 'Vacagen' Tablet contains carefully proportioned quantities of the water-soluble antigenic derivatives of approximately 60,000 million organisms commonly associated with infections of the upper respiratory tract. The fresh antigens are rapidly frozen, dehydrated under high vacuum, and made into enteric-coated tablets for oral administration.

'Vacagen' Oral Cold Vaccine Tablets are supplied in bottles of 20, 100, 500 and 1,000.

1. J. A. M. A., 116:1342, March 29, 1941.
2. Zinsser, H., & Bayne-Jones, S.: A Textbook of Bacteriology, D. Appleton-Century Co., 1934.

'VACAGEN' ORAL COLD VACCINE TABLETS

Sharp & Dohme PHILADELPHIA

WITH THE gradual diminishing of ovarian secretion most women in their late forties undergo a startling transformation. Vasomotor instability, nervous irritability, and emotional disturbances engendered by the deficiency of estrogenic hormone may, as has been so aptly described, "turn a placid and affectionate woman into an irritable termagant.*"

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These effective Roche-Organon estrogenic preparations offer the advantages of marked potency, prolonged action, convenience of treatment, and economy. Furthermore, unlike the artificial estrogens, Dimenformon and Dimenformon Benzoate seldom produce toxic side-effects, such as headache, nausea, vomiting and dizziness.

Literature and dosage schedules on request.

* *Lancet*, 1942, *1*:479.

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of distressing symptoms in

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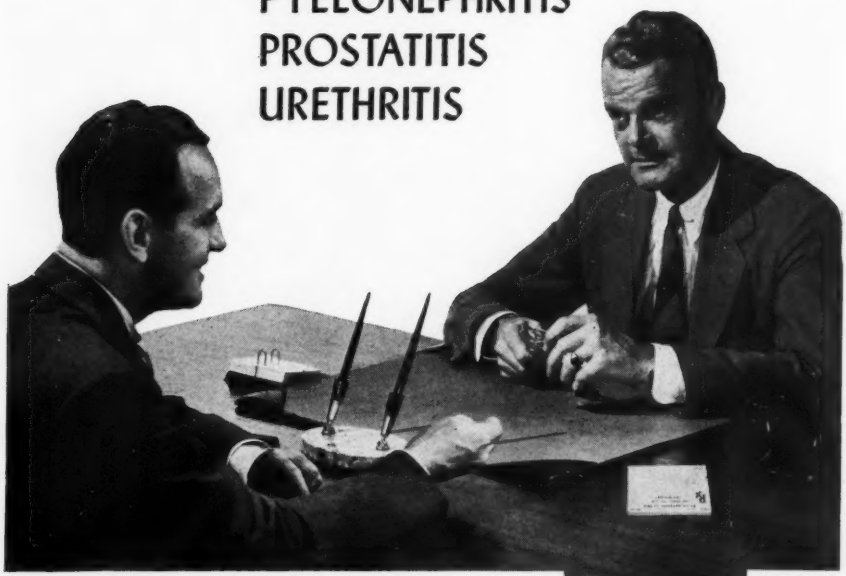

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THE prompt symptomatic relief provided by Pyridium is extremely gratifying to the patient suffering with distressing urinary symptoms such as painful, urgent, and frequent urination, tenesmus, and perineal irritability.

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THE usefulness of Heparin in the prevention and treatment of thrombosis and embolism has been demonstrated repeatedly. Its recognition as an effective treatment for pulmonary infarction is rapidly coming to the fore.

Keyes and Shaffer[1] have recently commented upon a series of 60 patients who received Heparin, three quarters of whom suffered from pulmonary infarction. The value of Heparin was well established in these cases. The authors observed that hemorrhage into the pleural cavity is an occasional complication with this treatment, but this infrequent disadvantage is outweighed by the obvious advantages of the treatment and should not deter the physician from the use of Heparin.

Lam[2] has also observed Heparin to be clinically useful in post-operative infarction. Recently Priestley and Barker[3] have reviewed 1665 cases of several types of thrombosis or embolism, of which 897 cases were pulmonary embolism. The authors concluded that the proper use of Heparin in post-operative pulmonary embolism will prove life-saving in a substantial number of cases.

"Heparin *Lederle*" is also frequently used for the prevention of blood coagulation in blood transfusions; and is widely employed in clinical laboratories for the prevention of coagulation in blood samples, increasing the ease of handling and simplifying the use of a single sample for multiple determinations.

"Heparin *Lederle*" is a sterile isotonic solution of the anti-coagulant substance extracted from animal tissue. It is considered to be a mixture of mucoitin sulfuric esters.

Literature will be mailed upon request.

PACKAGES:
10 cc. vial.

[1] KEYES, J. W., and SHAFFER, C. F.: J. A. M. A. 119:882 (July 11) 1942.
[2] LAM, C. R.: West Va. M. J. 38:215 (June) 1942.
[3] PRIESTLEY, J. T., and BARKER, N. W.: Surg., Gynec. & Obst. 75:193 (Aug.) 1942.

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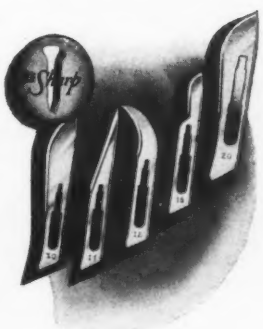

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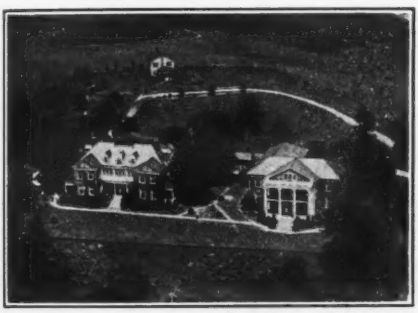

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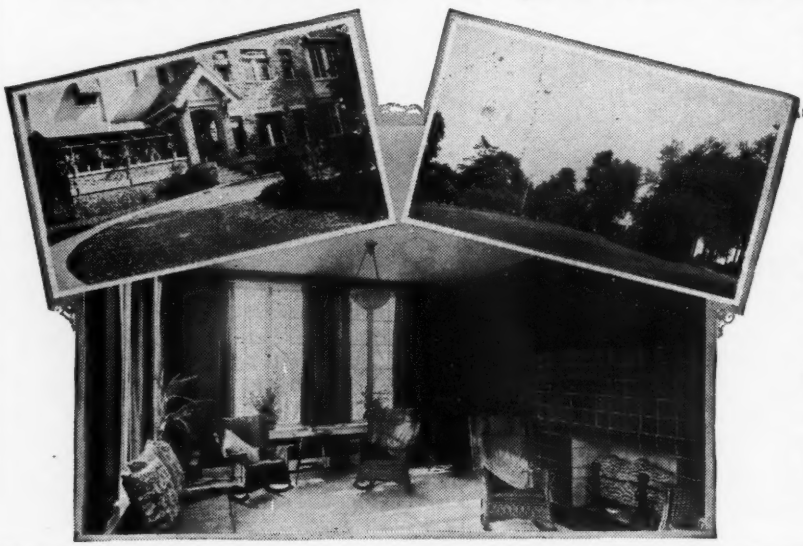

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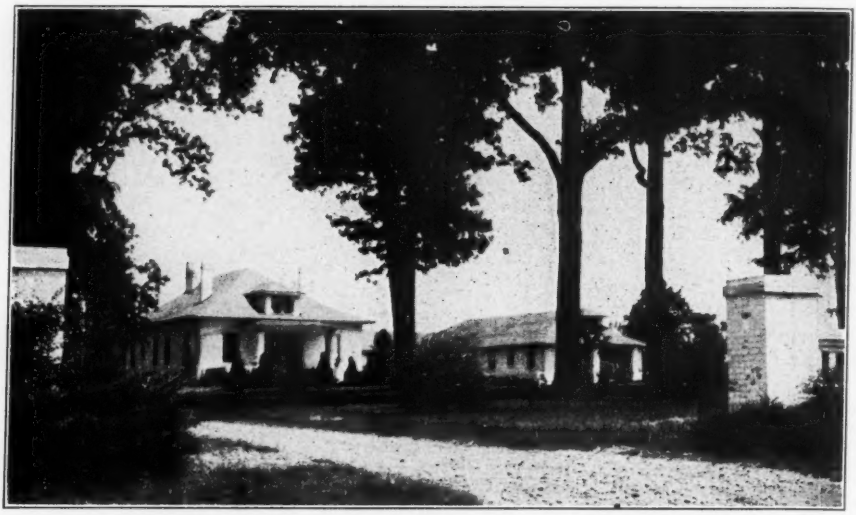

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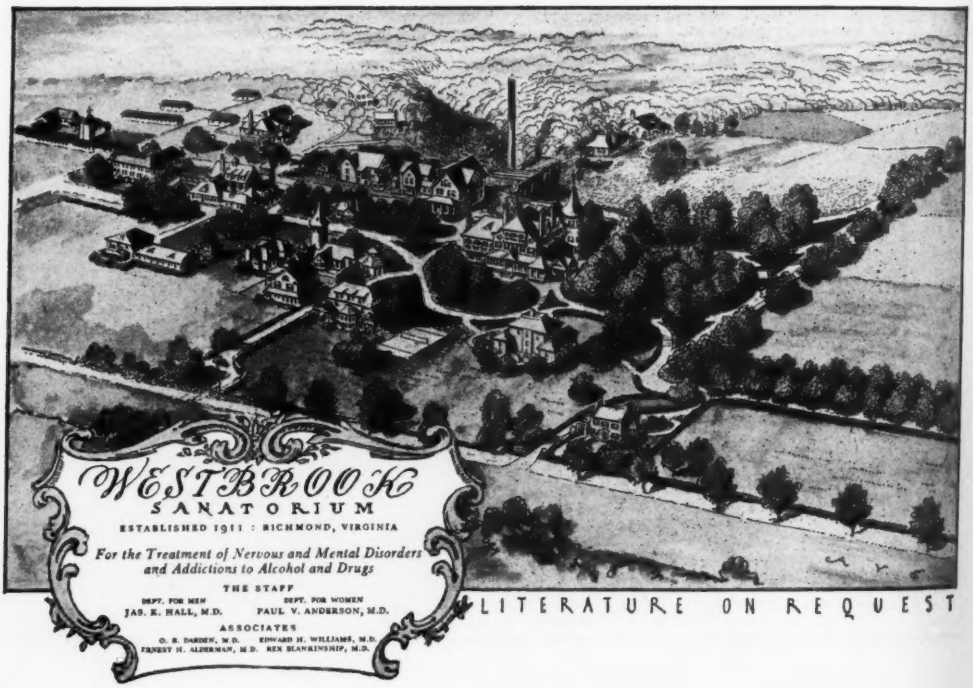
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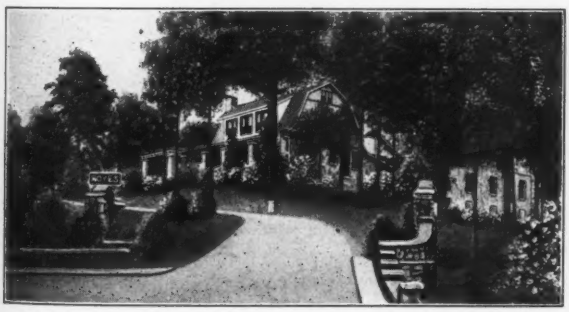

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GAS GANGRENE: EXPERIMENTAL OBSERVATIONS ON THE USE OF THE SULFONAMIDE DERIVATIVES AND ZINC PEROXIDE IN ITS TREATMENT AND PREVENTION*

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and
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Since the discovery of the value of certain sulfonamide derivatives in the prevention and treatment of various infections, the efficacy of these drugs in anaerobic infections and particularly in gas gangrene, has been investigated both clinically and experimentally.[1-5] The most recent experimental work indicates that these drugs, if inserted in the wound at the same time the infective organisms are introduced, not only will control the spread of gas gangrene but will eradicate mixed infections of gas bacillus, streptococcus and staphylococcus.[6-7] In 1937, Meleney and Johnson[8] advocated the use of a zinc peroxide paste in combating anaerobic, micro-aerophilic and aerobic organisms. On the basis of these suggestions, the following experiments were conducted in an effort to determine the relative prophylactic and preventive value of these various preparations.

DESCRIPTIONS OF EXPERIMENTS

Guinea pigs of comparable weight and size were used throughout the experiments. Following anesthetization with ether, the shaft of the femur was exposed through a lateral incision and two drill holes were made in the bone in an attempt to simulate a compound fracture. An effort was made to inflict a comparable amount of muscle damage with each exposure. The wound was then filled with 0.15 c. c. of an 18 to 20-hour broth culture of Cl. welchii, which is a minimal lethal dose. Subsequently, the wounds were subjected to various forms of treatment. It must be remembered that in these experiments a vegetative form of virulent strain of Cl. welchii was used. The type of infection produced was a rapidly extensive process with complete disintegration of the muscle tissues of the extremity and extension of the infection to the abdominal wall. Any animal living beyond 72 hours was arbitrarily considered a survival because it was felt that if they died after this time, it would be from secondary infection and not gas gangrene. The average time that the untreated animal lived was slightly more than a day, although in this group every animal showed extensive necrosis even if it survived the 72-hour period. In the operative preparation of these animals it was not possible to prevent secondary infection. Many of the pigs chewed their wounds open, many wounds spontaneously ruptured as the gas gangrene developed and many wounds were purposely kept open. These factors account for the deaths attributed to other causes than gas gangrene. After observing the effect of inoculation with a vegetative strain of the organism in over 500 guinea pigs, it was decided that no animal died from gas gangrene unless the infection extended into the abdominal wall causing considerable necrosis and lysis of the musculature of the extremity. In many animals there was local evidence of swelling, edema, serous exudate and crepitation, the progress of which the pigs were completely able to arrest. These were not considered to have developed true gas gangrene as recognized in the experimental animal.

Group 1

CONTROLS, 85 ANIMALS

The control group is large because whenever a group of animals was operated upon during

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the past year, two or three animals were used as controls. The present control series, therefore, not only explains the reaction of the organism in a closed wound that is not treated but also insures the continued potency of the organism and guarantees our ability to reproduce gas gangrene experimentally in guinea pigs. In all 85 of these animals, active gas gangrene developed. Seventy-three of the pigs died as a direct result of gas gangrene and 2 from other causes. There were 10 survivals. The survivals can be explained easily by the fact that animals have a natural resistance to infection. However, in every instance there was complete destruction and lysis of the thigh musculature. The average death time for the whole group was 27.8 hours. It is interesting to note that in a previously published article[9] a group of 58 controls was quoted with an average death time of 27.7 hours. During the subsequent experiments in which 27 controls were used, the average death time was 27.8 hours, a fact which emphasizes the consistency with which the experimental work was done.

CONTROLS	
Animals	85
Average death time	27.8 hours
Survivals	10
Developed gas gangrene	85
Died of gas gangrene	73
Died of other causes	2

Table I

Group II

SIMPLE INCISION, 22 ANIMALS

After the usual incision and inoculation with Cl. welchii, the wound was tightly closed for one hour. The skin incision was then enlarged to twice its original size, the wound irrigated with saline solution or tap water and then kept open. No difference was noted in the effect of the agent for irrigation. The average death time was 32.8 hours. Four animals in the group lived. Every pig manifested clinical evidence of gas gangrene at some time during the observation period, 18 of which (82 per cent) died as a result of the infection. Simple incision, therefore, did not prevent the development of gas gangrene but did help to combat it.

SIMPLE INCISION	
Animals	22
Average death time	32.8 hours
Survivals	4
Developed gas gangrene	22
Died of gas gangrene	18
Died of other causes	0

Table II

Group III

SURGICAL DEBRIDEMENT, 20 ANIMALS

The animals were prepared and the wounds inoculated in the usual manner. The wound was then tightly closed for one hour, after which time it was widely opened, and all traumatized and devitalized muscle tissue completely excised. No fragments of muscle sectioned transversely were allowed to remain. The entire lateral aspect of the femur was exposed, and because of the loss of support, the femur fractured with little trauma. Wherever the femur was broken through completely, the chance for development of active gas gangrene was increased so that the possibility of survival was practically *nil*. The average death time for this group was 63.1 hours. Significantly, only four animals had extensive clinical gas gangrene and two others showed local evidence without spread into the abdomen. Thus, 14 animals manifested no evidence of active infection at any time. The importance of the additional soft tissue trauma caused by the presence of a fractured femur must again be emphasized.

SURGICAL DEBRIDEMENT	
Animals	20
Average death time	63.1 hours
Survivals	14
Developed gas gangrene	6
Died of gas gangrene	4
Died of other causes	2

Table III

Group IV

INTRAPERITONEAL SULFANILAMIDE, WOUND CLOSED, 20 ANIMALS

One hour following the implantation of the culture medium, 50 mg. of sulfanilamide were injected intraperitoneally. The wound was allowed to remain closed. This dosage was repeated every six hours until the animals died or

survived the 72-hour period. All of the 20 animals died from active gas gangrene infection. The drug had no effect whatsoever upon the progress of the infection either in preventing its development or in retarding its extension. The average death time for the group was 28.9 hours as compared with 27.7 hours for the control group.

INTRAPERITONEAL SULFANILAMIDE, WOUND CLOSED	
Animals	20
Average death time	28.9 hours
Survivals	0
Developed gas gangrene	20
Died of gas gangrene	20
Died of other causes	0

Table IV

Group V

INTRAPERITONEAL SULFANILAMIDE, WOUND OPEN, 20 ANIMALS

One hour following the usual preparation, the wound was opened widely but not debrided. Every animal showed local evidence of gas bacillus infection. As soon as the wounds were opened, the average death time was immediately prolonged to 49.5 hours. This figure may be compared with Group II in which simple incision alone was used with an average death time of 32.8 hours. Although the difference in these two figures is not great, still the inference might be made that the use of sulfanilamide systemically exerts some slight inhibitory action upon the organism.

INTRAPERITONEAL SULFANILAMIDE, WOUND OPEN	
Animals	20
Average death time	49.5 hours
Survivals	4
Developed gas gangrene	20
Died of gas gangrene	14
Died of other causes	2

Table V

Group VI

INTRAPERITONEAL SULFANILAMIDE, DEBRIDEMENT, 20 ANIMALS

One hour after inoculation the wound was extensively debrided and the same dosage of sulfanilamide was injected intraperitoneally. Gas gangrene developed in three of the animals. Only two of the animals died as a direct result of gas gangrene; seven died of other causes. In one of these, the animal died because of a rupture of the peritoneum and viscera caused by a fractured femur. One pig died from the second anesthetic administered at the time of debridement and the remainder died of secondary infection. Eleven of the 20 animals survived. The average death time for the entire group was 62.7 hours. This figure is only slightly lower than the 63.1 hours for Group III in which extensive debridement alone was resorted to.

INTRAPERITONEAL SULFANILAMIDE WITH DEBRIDEMENT	
Animals	20
Average death time	62.7 hours
Survivals	11
Developed gas gangrene	3
Died of gas gangrene	2
Died of other causes	7

Table VI

Group VII

ZINC PEROXIDE, 29 ANIMALS

One hour after a compound fracture was experimentally produced, the wound was opened and zinc peroxide paste, which had been prepared immediately before, was placed in the wound. In 19 animals before the application of the paste the wound was thoroughly washed with normal saline. In 10 animals the wound was irrigated with plain water. After the paste was applied, all wounds were closed with interrupted sutures. In every animal evidence of definite gas gangrene infection was demonstrated at some stage during the observation. The average death time for the whole group was 45.3 hours. Seven animals survived. That the average death time in this group was a definite prolongation over that of the control series (27.7), we believe, indicates that the use of zinc peroxide paste has a definite inhibitory effect upon the development of active gas gangrene.

ZINC PEROXIDE	
Animals	29
Average death time	45.3 hours
Survivals	7
Developed gas gangrene	26
Died of gas gangrene	21
Died of other causes	1

Table VII

Group VIII

ZINC PEROXIDE, DEBRIDEMENT, 10 ANIMALS

One hour after routine preparation an extensive debridement was done. Zinc peroxide paste was then applied to the wound, after which it was closed with interrupted sutures. Of the 10 pigs, 8 showed evidence of active gas gangrene. The average death time was 48.7 hours. Three animals lived beyond the 72-hour period, a 30 per cent survival rate. Again, the inhibitory effect of zinc peroxide is apparent, but the most striking observation, in our opinion, is that as soon as the wound was closed, even though it was debrided, gas gangrene developed.

ZINC PEROXIDE WITH DEBRIDEMENT	
Animals	10
Average death time	48.7 hours
Survivals	3
Developed gas gangrene	8
Died of gas gangrene	7
Died of other causes	0

Table VIII

COMMENT

To obtain an accurate evaluation of the effect of zinc peroxide paste, it would be best to change the dressing at frequent intervals during the day. The technical difficulties of keeping a zinc peroxide paste dressing on a guinea pig with an open wound or with a debrided wound could not be satisfactorily overcome. Hence, all of the experimental work with zinc peroxide necessitated closing the wound. In spite of these difficulties the experiments suggest that zinc peroxide paste would be useful as a local dressing in clinical cases.

Group IX

SULFANILAMIDE, ONE HOUR, 20 ANIMALS

The animals were prepared in the usual fashion. At the end of one hour the wound was opened and approximately 0.5 gram of powdered sulfanilamide implanted. The wound was then closed with interrupted sutures. In 16 of the animals gas gangrene developed. Fourteen deaths could be attributed directly to gas gangrene, the two others to secondary infection. There were only four survivals in the group. The average death time was 34.4 hours. This figure can be compared with the average death time of 45.3 hours in Group VII in which the animals were treated with zinc peroxide. Sulfanilamide introduced one hour after inoculation seemed to retard the progress of the disease only slightly and was less effective than zinc peroxide. One may conclude, therefore, that once the infection has developed and the soft tissue has been invaded, the local implantation of sulfanilamide does not materially affect further progress of the disease.

SULFANILAMIDE USED LOCALLY	
Animals	20
Average death time	34.4 hours
Survivals	4
Developed gas gangrene	16
Died of gas gangrene	14
Died of other causes	2

Table IX

Group X

IMMEDIATE SULFANILAMIDE, 20 ANIMALS

At the time of inoculation about 0.5 gram of sulfanilamide was implanted. The wound was then closed with interrupted sutures and allowed to remain closed. Ten of these animals developed signs of gas gangrene, and 7 died from the infection; two died of other causes. There were 11 survivals in the group. The average death time for the whole group was 55.7 hours. It will become immediately apparent that when sulfanilamide is implanted early even though a vegetative form of gas bacillus organism is being used for inoculation, still the drug has a definite inhibitory action on the development of gas gangrene and is responsible for a remarkable number of survivals. The average death time in this group compares favorably with Group III, in which the wound was extensively debrided and left open.

SULFANILAMIDE AT INOCULATION TIME	
Animals	20
Average death time	55.7 hours
Survivals	11
Developed gas gangrene	10
Died of gas gangrene	7
Died of other causes	2

Table X

Group XI

IMMEDIATE SULFANILAMIDE, 6-HOUR DEBRIDEMENT, 19 ANIMALS

The animals were prepared and at the time of inoculation about 0.5 gram of sulfanilamide was introduced. The wound was closed for six hours. The reason for waiting six hours to debride the wound was to show that the inhibitory effect of the drug could be relied upon, thus permitting the prolongation of the period between inoculation and debridement itself. At the end of six hours the wound was debrided, about 0.5 gram of sulfanilamide inserted and the wound sutured. The fact that the wound was closed places a greater test on the effectiveness of the drug, since it will be remembered that in Group III after debridement the wound was allowed to remain open. With the six-hour debridement still only 3 animals showed signs of definite gas gangrene and only two deaths could be attributed to this infection primarily. There were 14 survivals out of 19 animals. The average death time for the whole group was 63.5 hours.

IMMEDIATE SULFANILAMIDE WITH 6-HOUR DEBRIDEMENT	
Animals	19
Average death time	63.5 hours
Survivals	14
Developed gas gangrene	3
Died of gas gangrene	2
Died of other causes	3

Table XI

Group XII

IMMEDIATE SULFANILAMIDE, 12-HOUR DEBRIDEMENT, 19 ANIMALS

Approximately 0.5 gram of sulfanilamide was implanted immediately following inoculation. The wounds were closed for twelve hours, after which they were debrided. Approximately 0.5 grams of sulfanilamide was again inserted and the wounds were closed. In this group definite gas gangrene developed in 14 of the 19 animals and all of these died as a direct result of the disease. Three animals died at 71 hours from other causes and there were only two survivals. The average death time for the whole group was 45.4 hours.

IMMEDIATE SULFANILAMIDE WITH 12-HOUR DEBRIDEMENT	
Animals	19
Average death time	45.4 hours
Survivals	2
Developed gas gangrene	14
Died of gas gangrene	14
Died of other causes	3

Table XII

COMMENT

The animals in Groups X, XI and XII all showed evidence of localized gas gangrene in the wound. That this infection was present is apparent from the fact that definite gas was seen in the wound at the time of debridement in the majority of the animals. Furthermore, cultures taken from the wounds showed almost pure strains of B. welchii. Possibly the incidental trauma resulting from debridement done at twelve hours was more than the animal's resistance would combat, and this factor may explain the higher incidence of gas gangrene in this group than in Group IX.

Group XIII

IMMEDIATE SULFADIAZINE, 20 ANIMALS

Following inoculation about 0.5 gram of sulfadiazine was implanted and the wound sutured and allowed to remain closed. Only 4 of the animals manifested clinical evidence of progressive gas gangrene and these four died from the infection. There were 16 survivals in the group, the average death time being 68.3 hours.

IMMEDIATE SULFADIAZINE	
Animals	20
Average death time	68.3 hours
Survivals	16
Developed gas gangrene	4
Died of gas gangrene	4
Died of other causes	0

Table XIII

Group XIV

IMMEDIATE SULFADIAZINE WITH 6-HOUR DEBRIDEMENT, 20 ANIMALS

Following inoculation approximately 0.5 gram of sulfadiazine was inserted and the wound closed. Six hours later the wound was opened,

debrided and approximately 0.5 gram of sulfadiazine again placed in the wound, which was then closed. Four of the animals showed clinical evidence of gas gangrene and 4 deaths could be attributed directly to this disease. One animal died of other causes. There were 15 survivals. One animal which died at 71 hours might almost be considered a survival. The average death time for the whole group was 66 hours.

IMMEDIATE SULFADIAZINE WITH 6-HOUR DEBRIDEMENT

Animals	20
Average death time	66 hours
Survivals	15
Developed gas gangrene	4
Died of gas gangrene	4
Died of other causes	0

Table XIV

Group XV

IMMEDIATE SULFATHIAZOLE, 20 ANIMALS

Following inoculation approximately 0.5 gram of sulfathiazole was implanted and the wound closed. Only three animals in the group showed definite progressive gas gangrene. Only one animal died as a direct result of gas gangrene. The other two animals died from secondary infection. There were 17 survivals and the average death time was 68.6 hours. A comparison of this group with Group IX suggests that sulfathiazole is more effective against the gas bacillus infection than sulfanilamide.

IMMEDIATE SULFATHIAZOLE

Animals	20
Average death time	68.6 hours
Survivals	17
Developed gas gangrene	3
Died of gas gangrene	1
Died of other causes	2

Table XV

Group XVI

IMMEDIATE SULFATHIAZOLE, 6-HOUR DEBRIDEMENT, 20 ANIMALS

The wound was prepared in the usual fashion after which approximately 0.5 gram of sulfathiazole was implanted and the wound closed. Six hours later the wound was opened wide, debrided, about 0.5 gram of sulfathiazole again implanted and the wound closed. In none of these animals did gas gangrene develop though several showed evidence of localized swelling and slight crepitation. All 20 of the pigs lived, a survival rate of 100 per cent.

IMMEDIATE SULFATHIAZOLE WITH 6-HOUR DEBRIDEMENT

Animals	20
Average death time	72 hours
Survivals	20
Developed gas gangrene	0
Died of gas gangrene	0
Died of other causes	0

Table XVI

DISCUSSION

It is difficult to correlate the vast amount of information derived from such widely different experiments. Yet we believe that it is perfectly fair to compare Groups I, II and III with Groups IV, V and VI, that is, a major group in which surgical debridement alone was done with a group in which sulfanilamide was injected intraperitoneally. It may be deduced from these experiments that intraperitoneal sulfanilamide only slightly retards the progress of gas gangrene and is of no prophylactic value whatsoever, since it did not of itself prevent the development of gas gangrene in a single instance. When the average death time and the number of survivals in comparable groups, that is, those with closed wounds, open wounds and debrided wounds, are studied, it will be seen that sulfanilamide systemically administered only slightly prolonged the survival period but not significantly so. One must bear in mind that experimental gas gangrene is a much more rapidly progressive type than would be encountered clinically in compound fractures.

COMPARISON OF INTRAPERITONEAL SULFANILAMIDE AND DEBRIDEMENT

Group	RX	Pigs	A. D. T.	Surv.	Dev. G. G.	Died G. G.	Other Deaths
I	None	85	27.8	10	85	73	2
IV	I. P. Sulfan. Wd. closed	20	28.9	0	20	20	0
II	Wd. open 1 hr.	22	32.8	4	22	18	0
V	I. P. Sulfan. Wd. open	20	49.5	4	20	14	2
III	Deb. 1 hr. Wd. open	20	63.1	14	6	4	2
VI	I. P. Sulfan. Deb. Wd. open	20	62.7	11	3	2	7

Table XVII

When comparing Group VII, in which zinc peroxide was applied to the wound with Group IX, in which sulfanilamide was implanted one hour following inoculation and the wounds allowed to remain closed, one is struck by the fact that neither sulfanilamide nor zinc peroxide prevented the rapid development of gas gangrene in the majority of the animals. It is true that zinc peroxide did definitely prolong the average death time beyond that of the control group. On this basis alone we might infer that the zinc peroxide would be valuable as a local dressing; however, as a prophylactic agent it is not as effective as other measures. The delay period of one hour apparently allowed the organism to invade the tissues and to progress to the point where neither the sulfanilamide nor the zinc peroxide could arrest its progress completely. Both drugs acted merely as inhibiting factors.

COMPARISON OF ZINC PEROXIDE AND SULFANILAMIDE

Group	RX	Pigs	A. D. T.	Surv.	Dev. G. G.	Died G. G.	Other Deaths
VII	ZnO_2 local 1 hr. Wound closed	29	45.3	7	26	21	1
IX	Sulfan. local 1 hr. Wd. closed	20	34.4	4	16	14	2

Table XVIII

A series of experiments was performed to determine the relative effectiveness of sulfanilamide, sulfathiazole and sulfadiazine when implanted at the same time as the infecting organisms. Although the number of animals was too small to make accurate comparisons, the results of the experiments seemed to indicate that sulfathiazole is probably the most effective in preventing the development of gas gangrene. The most significant point, in our opinion, is the fact that though the infection was the most fulminating type, still the immediate use of any of the sulfonamide drugs in the wound prevented the progress of the infection in most instances and was responsible for a much larger number of survivals. In the control group of 85 animals the survival rate was 11.8 per cent. In the group of 60 animals in which the sulfonamide drugs were placed in the wounds and the wounds were closed primarily there were 44 survivals, a rate of 73.3 per cent. The difference in these two figures is so great as to emphasize the immediate use of one of the sulfonamide derivatives as an excellent measure in preventing the development of gas gangrene as well as in retarding its progress. The significance of this statement is increased if reference is made to Group IX, in which sulfanilamide was implanted one hour after inoculation. Here, the majority of the animals died as a result of gas gangrene. The delay of one hour made a remarkable difference in the effectiveness of the drug as a prophylactic agent. In Groups XI, XIV and XVI one of the sulfonamides was implanted, six hours later the wound was debrided, the drug was re-implanted and the wound closed. Totaling all three groups we note that 49 out of 59 animals survived. In the sulfanilamide and sulfadiazine groups several instances of active gas gangrene appeared. In comparing these three groups with any of the earlier experiments one must remember that in the later series the wound was kept closed. In the earlier experiments the wound was not sutured after debridement. Closing the wound in the presence of an anaerobic infection places an even greater task upon the drug. Thus, its value as a prophylactic agent in the present experimental group is again emphasized.

The action of the various sulfonamide drugs, particularly sulfathiazole, in the type of rapidly developing infection which has been produced in guinea pigs is remarkable enough to warrant the use of these drugs in the immediate primary care of compound fractures. In our experiments the use of the sulfonamide drugs has allowed us to postpone debridement for six hours and still insure that most of the animals would live. A greater margin of safety probably will be allowed if the drug is used early in the clinical

SULFONAMIDES WITH CLOSED WOUND

Group	RX	Pigs	A. D. T.	Surv.	Dev. G. G.	Died G. G.	Other Deaths
X	Immed. Sulfan. closure	20	55.7	11	10	7	2
XIII	Sulfadiazine	20	68.3	16	4	4	0
XVI	Sulfathiazole	20	68.6	17	3	1	2
XI	Sulfan., Debr., Sulfan., closure	19	63.5	14	3	2	3
XIV	Sulfadiazine	20	66.0	15	4	4	0
XVI	Sulfathiazole	20	72.0	20	0	0	0

Table XIX

CLOSED WOUND WITH AND WITHOUT SULFONAMIDE

Treatment	Animals	Survivals	
		No.	Pct.
Wounds closed, no treatment	85	10	11.8
Immediate sulfonamide, wd. closed	60	44	73.3
Immediate sulfonamide, 6-hour deb., wd. closed	59	49	83.0

Table XX

case. This does not mean that the drug should be relied upon entirely to eradicate the development of gas gangrene. However, it definitely is a most valuable adjunct to other measures in the primary care of compound fractures. Therefore, the implantation of one of the sulfonamide drugs, and on the basis of our present information, preferably sulfathiazole, in a compound fracture as a first aid measure is to be strongly recommended. Only clinical trial in a large number of cases will substantiate our experimental observations. Such a clinical investigation is now being conducted at Charity Hospital in New Orleans.

CONCLUSIONS

(1) The effectiveness of surgical debridement in controlling the development and spread of gas gangrene has again been emphasized in these experiments.

(2) Zinc peroxide as a local dressing in a severely contaminated wound has a definite inhibitory action upon the progress of gas gangrene.

(3) The immediate implantation of one of the sulfonamide drugs will in the experimental animal inhibit the development of gas gangrene in most instances.

(4) Once the organism has invaded the soft tissues and begun to spread, the effectiveness of sulfanilamide progressively decreases as time lapses between the period of inoculation and initiation of treatment.

(5) On the basis of experimental evidence the local implantation of sulfathiazole at the scene of the accident is encouraged. Its use in a large series of clinical cases of compound fracture will determine its practical value.

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DISCUSSION (*Abstract*)

Dr. J. Albert Key, St. Louis, Mo.—Dr. Caldwell has been working on this subject for a good while and this report is more encouraging than a previous one in which he indicated that sulfanilamide was of relatively little value.

I was a little confused as to whether or not he was talking of sulfadiazine or of sulfathiazole. I thought that on the chart it said "diazine" and in his summary he said "thiazole." In so far as I have been able to determine they have about the same bacteriostatic power. The principal difference is that sulfadiazine is less soluble and more expensive and that is of importance because I think this work, and perhaps others of a similar nature, will lead to the placing of sulfathiazole, or possibly a mixture of sulfathiazole and sulfanilamide, in the first aid kits of soldiers who are going into battle. If these drugs are implanted into the wounds immediately or relatively soon after the inception of the wound, there is no question in my mind that this will make the later debridement of the wound more successful and will increase the number of soldiers who survive. In civilian practice the patient cannot be treated until he reaches the hospital, which is rarely within one hour. It suggests, however, that in civilian practice when a patient suffers a large compound fracture with extensive contamination and devitalization of tissues one

of the first things which should be done is to sprinkle the powder in the wound.

Last week in Boston we had a panel discussion on the treatment of compound fractures. There were four men in the discussion, and three of them believed that the fracture should be treated immediately, regardless of the patient's condition, holding that the treatment of the fracture was one of the most effective means of combating shock. I believed, and still believe, that the general condition of the patient is the primary consideration and that the patient must be treated for shock before operative treatment of the fracture is undertaken if the shock is of a grave degree. In such a patient, along with the treatment of shock and while things are being gotten ready for the operation which may require several hours, the implantation of one of these drugs, preferably sulfathiazole, in the wound would inhibit the development not only of gas gangrene but of streptococcic and staphylococcic infections. This will permit closing the wound after the debridement or give the patient a better chance if the surgeon belongs to that school, which I believe will gradually lessen in number, who believe that all compound fractures should be left open and allowed to heal by granulation.

Dr. Frank D. Dickson, Kansas City, Mo.—We have been using the sulfonamides in the treatment of compound fractures for over two years, but because we did not feel that the evidence at hand was sufficient to indicate that these drugs were potent against the anaerobes, we have been giving both antitetanic serum and gas serum in addition. Dr. Caldwell's work certainly suggests that we have in these drugs something which will take care of the anaerobes, provided they are used in sufficient concentration and sufficiently early. An adequate concentration of the sulfonamides in the immediate vicinity of the infecting bacteria early is the keynote of success.

The problem that presents itself, then, is to get the sulfonamides into the wound in sufficient amounts and soon enough to prevent tissue necrosis with the liberation of the sulfonamide inhibitor substances.

This problem has certain technical difficulties. It is going to be difficult to see to it that all compound wounds are immediately sprinkled with one of the sulfonamides. I think, however, that this can be done in time.

We absolutely agree with Dr. Albert Key, that compound fractures should be closed primarily if possible. I should like to add this suggestion to Dr. Caldwell's fight for immediate implantation of the sulfonamides: that the wound be tamponed as soon as the material is put in and that this tampon be maintained in place until the case is debrided.

I was very much interested in the failure of results from the systemic administration by intraperitoneal injection. The reason for this is quite clear. We know that it takes about four, five, or six hours to get an adequate concentration of the drug in the blood stream when administered by mouth. How long it takes when injected into the peritoneum I do not know, but believe that it will take as long if not longer. We have been very much intrigued in our compound fractures by the effects of sodium sulfathiazole administered intravenously. We have found that within five minutes of the administration of 0.06 grams per kilo of sodium sulfathiazole, we could get in the blood stream a blood concentration, as high as 47 milligrams per 100 c. c. This concentration fell rather rapidly during the first hour, but was maintained up around 4 and 5 per cent for as long as five hours. It would be interesting if Dr. Caldwell would carry out some experiments with sodium sulfathiazole without the local implantation, to see what it will do. We have used sodium sulfathiazole intravenously in conjunction with the local implantation of sulfathiazole, so we do not know what it would do alone.

The other point which I think Dr. Caldwell beautifully emphasized was this: that chemotherapy alone cannot supplant sound surgical principles in the treatment of compound fractures. If you do not debride thoroughly, then you do not get good results. These drugs are adjuncts to adequate surgery.

Dr. C. J. Frankel, University, Va.—We have been doing some work on rabbits; we gave these animals inoculations of staphylococcus into the knee joint. We used the drug locally, that is, injected in the knee joint, combined with the oral route, combined also with the intravenous route. We found that after we had given the animals an overwhelming infection, no drug or series of drugs would touch it. On the other hand, given a small infection which in the control series goes on to an overwhelming infection in a series of days, sodium sulfathiazole given intravenously in conjunction with the local administration of the drug does give valuable results.

I am also glad to see that Dr. Caldwell has told you that the drug is merely an adjunct and not the whole treatment of the infection. Most people have come to feel that the drug today is taking the place of Lydia Pinkham's compound and is supposed to do everything. We have found in our experimental series that unless the surgical procedures are added to the chemotherapeutic procedures, the large majority of cases do not get along as well as if they were treated by surgery alone, that is, in the cases showing an overwhelming infection.

Dr. Caldwell (*closing*).—We performed one experiment to compare the effectiveness of sulfathiazole and sulfadiazine. Sulfathiazole gave the better results.

I am rather surprised at our good friend's pessimistic attitude about the impracticability of using this drug as a first aid measure in civilian cases. If transportation and splints can be made available to the patients by means of an ambulance, certainly the drug can be gotten to them. In most ambulances there are surgeons who should be able to open the wound and implant sulfathiazole. I should like to emphasize that a large amount of the drug should be used because there is going to be some leakage and the residual is going to be removed by debridement.

Unquestionably, most of the wounds produced in these animals were contaminated with other organisms, and yet primary healing was obtained in the last group.

If we can be assured of controlling the anaerobes, I believe that we are going to be able to control all infection. This would make it possible, then, for us to attain that ideal for which we have long striven: to convert the compound fracture into a simple fracture, to use internal fixation when and as required and to use the type of external fixation which is most secure and easy to apply.

Unquestionably, we still have to analyze a large series of clinical cases, thus treated, in order to determine the efficacy of the drug accurately. The Fracture Committee of the Academy is undertaking such a study. It will be necessary, in centers where fractures are being treated by members of our group, like you here, that we insist that our ambulance surgeons take the drug with them and implant it in the wound at the place of accident, and that careful records be made and returned to one central source for analysis. When this is done, I think that the results will be good.

REBREATHING IN ANESTHESIA*

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Irrespective of the technic employed in inhalation anesthesia there is some rebreathing of exhaled gases. The smallest and the simplest mask placed on a patient's face immediately institutes rebreathing. Rebreathing is at a minimum in the open drop technic of anesthesia, but may be increased by additional layers of gauze or the wrapping of towels about the mask. Devices completely enclosing inhaled gases but allowing exhalations to pass from the mask through a valve, are termed semi-closed systems. Some degree of rebreathing occurs in these particularly if the valve is not efficient. Completely closed systems designed for total rebreathing have no communication whatever to the outside air. Carbon dioxide may accumulate in these systems if not adequately eliminated and cause physiologic disturbances. Likewise if rebreathing is not carefully controlled oxygen tension may be lowered below the physiologic need, or excessive resistance to inspiration or expiration or both may be introduced.

Total rebreathing has resulted in improvements in three phases of inhalation anesthesia. Firstly, the carbon dioxide tension is more readily controlled. Secondly, it minimizes the quantities of drugs used to a point never before realized. Thirdly, a completely closed system confines inflammable mixtures and by maintaining high humidity in the system reduces the hazard of explosions. Carbon dioxide is best removed by chemical absorption. Although carbon dioxide absorption was introduced into the anesthesia in 1923 by Waters,[1] its use became widespread only recently due to the influence of cyclopropane. Both the expense and inflammability of this gas would make its use prohibitive by the semi-open methods. The improvements in the chemical absorbents have also contributed to the advancement of this technic.

Alkalies are the best absorbents for carbon dioxide. From the standpoint of convenience in handling, efficiency, and cheapness, soda lime is the most popular absorbent. Soda lime is a mixture of calcium and sodium hydroxides prepared in granular form.[2] A special preparation containing 5 per cent sodium hydroxide and a high grade of calcium hydroxide is used for anesthesia. To this must be added a small percentage of silica which imports hardness and maintains the shape of the granules so that dust formation is minimized. Two types of lime are available: the moist which has added to it 14-20 per cent water, and the dry which contains less than 2 per cent. The moist lime was designed for those acidic substances of low activity such as carbonic acid. Both types have been used experimentally and clinically in canisters, and found to be satisfactory. One-fifth by weight of the moist lime is water; therefore, absorption power is less per pound. Sodium hydroxide confers the activity to soda lime as it is a stronger base and more soluble than calcium hydroxide. More than 5 per cent of it in the mixture tends to cause heating, caking, and deliquescence; less than 5 per cent decreases the activity and efficiency.

The reaction of this absorption is a neutralization. Carbon dioxide combines with water to form carbonic acid which in turn yields hydrogen ion. This combines with the hydroxyl ion derived from the alkali to yield water and approximately 14,000 calories of heat. Heat and water formation are evidence of absorption.

The absorbent is prepared in irregular-shaped granules of carefully graded sizes. The size is important. Too large a granule minimizes resistance but reduces absorption efficiency as it does not expose an adequate surface per unit weight of lime. A decrease in the size of granules increases efficiency of absorption but also resistance. An inter-mixture of 4-8 mesh lime (standard screen) has been found to be most effective for anesthesic appliances.[3]

Recently mixtures of barium and calcium hydroxides have been introduced as absorbents.[4] Barium hydroxide hydrated with 8 molecules of water (20 per cent) is mixed with calcium hydroxide 80 per cent and compressed into

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tablets 3/16-inch in diameter.* Barium is more active chemically than calcium and assumes the role of sodium hydroxide in soda lime. Laboratory investigations and clinical trial indicate an efficiency equal to soda lime. Heat and water formation vary little from soda lime under identical conditions.

Regardless of the fact that numerous models of different apparatus are manufactured, two general types of rebreathing units are known. The more familiar or "circle filter" type is composed of a canister to contain the absorbent with valves interposed at the outlets. These valves allow only an unidirectional flow of gases over the absorbent. The gases come into contact with the absorbent once (*Fig. 1*). The other and less popular type of unit, known as the "to and fro," consists of a mask, rebreathing bag and canister. In this, gases pass from the mask through the canister to the bag on expiration and back over the absorbent on inspiration. In view of the fact that the carbon dioxide output, respiratory rate tidal volume vary not only from patient to patient, but even with the same patient and that charges of soda lime last as long as six or seven hours, any comparative study of absorbents is difficult clinically. A mechanical spirometer designed to simulate usual conditions of respiration allowed a comparison of these two types of units in the laboratory.[5]

*Manufactured by E. K. Medical Gas Company as "baralyme."

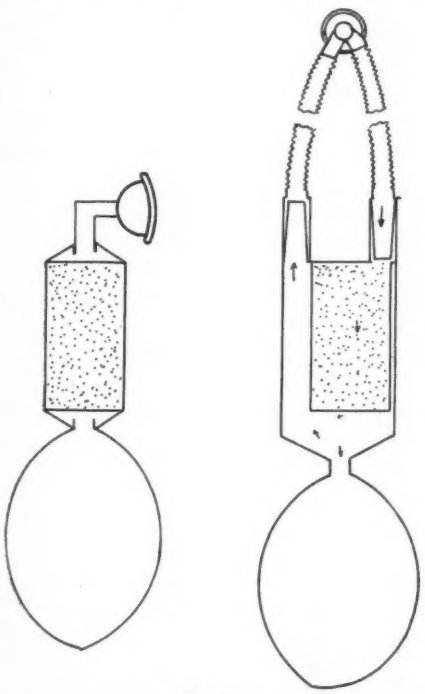

Fig. 1

The two types of rebreathing appliances for anesthesia are shown. The "to and fro" type consists of a bag and canister containing the absorbent and mask. The "circle filter" consists of a canister with valves at inlet and outlet which permits an unidirectional flow of gases only.

When a tidal volume of 500 c. c., a carbon dioxide flow of 150 c. c. per minute and a respiratory rate of 20 per minute were used on an 8x13 cm. canister charged with 500 gm. of 4-8 mesh soda lime, carbon dioxide absorption proceeded efficiently for two and one-half hours using unidirectional flow of gases in the "circle filter." Under similar conditions the "to and fro" absorbed efficiently without interruption for five hours. This does not imply, however, that following the 2½-hour interval in the "circle filter" or the five-hour one in the "to and fro," the charge of soda lime is completely exhausted. The exhaustion is only apparent. If either unit remains at rest for a half-hour or more and is used again absorption will proceed once more as efficiently as before. A rejuvenation of activity occurs due to the fact that sodium hydroxide, which is more active chemically, combines preferentially with carbon dioxide to form sodium carbonate.

Sodium carbonate is soluble and reacts with calcium hydroxide in the granule which is less soluble and less active. Calcium carbonate is insoluble, and, of course, this reaction is nonreversible. After such a "rest" the "circle filter" will absorb for a briefer interval of two hours before another apparent exhaustion occurs. After a number of intervals of efficient use with intervening rest periods, each one of which is shorter than the preceding, the charge is actually exhausted and must be discarded. The periods of use after rejuvenation are much less for the "to and fro," lasting a total of one to two hours and then the charge is completely exhausted[6] (*Table 1*).

Weight for weight then, approximately the total absorption time is obtained per 500 gm. of lime in each type of unit under the same conditions even though more frequent rest periods are required with the "circle filter." A two chambered absorber would be ideal in a "circle filter" as it would allow one chamber to rest and reactivate the soda lime while the other is in operation. The uninterrupted interval of efficient

absorption with the "to and fro" compared to the "circle" is due to surface phenomenon on the granules. As the gases pass into the canister on expiration one side of the granule is exposed and then the other side on inspiration. In the "circle filter" only one side and frequently only a part of it is exposed as air enters the canister. The rest periods allow the sodium carbonate, which forms preferentially to permeate throughout the entire granule and eventually convert all the calcium hydroxide to carbonate. Less surface is involved, but this is offset by allowing more time for reactivation.

The size of the canister is one of the most important details for efficient absorption. The inter- and intra-granular air space totals approximately 425 c. c. The tidal volume must be equal to or approximate this air space. If the tidal volume is less than the air space as might occur when a large canister is used for a child, or in cases of respiratory depression, efficiency is unimpaired in the "circle filter," but decreased in the "to and fro." The absorbent in the front portion of the canister becomes exhausted because it is exposed to the gases, but that in the rear position is unexposed and remains unchanged. In such cases smaller canisters such as 7x13 or 6x10 are desirable. In these the tidal volume is more exactly accommodated by the inter- and intra-granular air spaces. If the tidal volume exceeds the air space of a canister the efficiency likewise decreases, but in this case in both the "circle" and "to and fro" units. The gases rush through quickly since they are not entirely accommodated in the container.

Most canisters are cylindrical since this is the most convenient form. Shape affects efficiency little, provided the air space of the canister and tidal volume relationship are maintained almost equal.[6]

The heat from the reaction may be an objectionable feature in the "to and fro" unit because of the proximity of the canister to the mask. The temperature of the reacting alkali within the

A COMPARISON OF TIME EFFICIENCY BETWEEN THE "CIRCLE" AND THE "TO AND FRO" TYPES OF FILTERS UNDER VARYING CONDITIONS OF TIDAL VOLUME. RESPIRATORY RATE AND CO_2 OUTPUT IS SHOWN. AN 8x13 CMS. CYLINDRICAL CANISTER CHARGED WITH 500 GRAMS OF 4-8 MESH STANDARD (LOW MOISTURE) LIME WAS USED.

Tidal Volume c. c. of Air	Resp. Rate Per Min.	CO_2 Per Minute	Hours of Efficient Uninterrupted Absorption		Total Hours Efficient Absorption
500	20	200	Circle	2½	6½
			To and Fro	4½-5	6½
1000	20	200	Circle	2	
			To and Fro	2¾-3	
500	20	500	Circle	1¼	
			To and Fro	2½	
250	40	200	Circle	2½	
			To and Fro	2½	
1000	20	400	Circle	½	
			To and Fro	1	

Table 1

canister at times may exceed 60° C. causing the expired air to be warmed above body temperature. The temperature of the inspired air (in the mask) averages between 39-41° C. This heating is less of a problem in the "circle filter" where the long tubing, the large chamber, valves, canister, and so on, dissipate the heat. The temperature in the mask rarely exceeds 32-33° in these units. The amount of heat formed depends directly upon the carbon dioxide output. The effects of inhaling air warmed above temperature were studied in conscious subjects.[7] One hour to one and a half hour's inhalation of air ranging from 39-41° produced no apparent changes in circulation and respiration. In subjects who normally exhibited oral temperatures below 98.6° F. this became elevated to this level but not above. Likewise no rises were noted in rectal temperatures in these subjects. The skin became flushed and warm, however. These symptoms were not obtained or were less obvious with the circle filter on normal conscious subjects. The temperature of subjects under anesthesia varies with the environmental conditions. The heat regulatory mechanism is frequently disturbed due to the action of the anesthetic drug on the nervous system. The heat dissipating mechanisms are also disturbed.[8] During general and spinal anesthesia the peripheral vessels dilate and the skin temperature rises, causing more heat to be lost. Studies of temperature changes under anesthesia are, therefore, complicated. Blankets, draping, and sweating contribute further variations making such a study still more difficult. The lungs are also a channel for dissipation. Rebreathing particularly with the "to and fro" in which case heat may even be added, prevents loss from this avenue. Whether or not this has a beneficial or detrimental effect is controversial and requires further study.

The dust factor, however, is negligible in the "circle filter" since the canister is far removed from the mask. The alkaline dusts may become a potent source of irritation to the upper respiratory passages in the "to and fro" if the soda lime is fragile or dusty. Laryngeal spasms are frequent if the canister is not thoroughly blown out with air before each case. The barium lime tablet absorbent does not fragment and is less dusty.[4]

When a subject respires from a partly closed or a closed system a slight negative pressure develops within the mask upon inspiration which returns to zero at the end of inspiration, followed by a slight positive pressure upon expiration.[9] At the expiratory pause the pressure again returns to zero. These fluctuations of pressures depend upon the ease with which gases pass through the unit. Resistance to the passage of gases increases pressure values in either negative or positive phases depending upon type and location of the impedance. A water manometer connected to the mask allows one to measure these pressure changes and study the degree of resistance in these appliances. The factors that influence resistance to the greatest extent are the size of apertures of masks, canisters and intra-tracheal tubes, size and shape of canisters, length and type of tubing and presence or absence and type of valves. The smaller the openings in canisters, connecting pieces, and other parts, the greater the resistance. Apertures in any part of the system should always have a diameter equivalent to or greater than that of the trachea. Tubing from canister to mask, if excessive in length, increases the surface over which gases must glide, and increases friction which is in reality an increase of resistance. The optimum length of tubes is three feet or less.

Valves, if not carefully constructed, contribute considerable resistance. They should be light, and should open and close with a minimum of effort. In some "circle filters" valves are made of soft rubber. These may be efficient when new, but become rigid with age and cause increased resistance. The valve in the semi-closed system offers resistance to expiration only, and may increase rebreathing and possibly cause a rise of carbon dioxide above the optimum in the system. Resistance varies with the type as well as age of these appliances. Present day machines are being constructed to reduce this factor to a minimum.

Resistance to respiration in the "to and fro" averages 2.5 to 3 mm. of water while in the "circle filter" it ranges from 5-8 mm. of water compared under identical conditions using a tidal volume of 500 c. c. of air, a respiratory rate of 20, cylindrical 8x13 cm. canisters and 2.5 cms. apertures throughout.* Approximately two-thirds the resistance in the average ordinary "circle filter" is attributable to tubes and valves. The canister and its charge of soda lime contribute approximately one-third. Resistance due to the size of soda lime has been mentioned previously. It is essential that the proper size lime be used in these units to minimize this factor.

Resistance likewise varies with tidal volume. The greater the tidal volume the greater the pres-

*These studies were done on the Foregger circle filter.

sure changes on the manometer. If all other factors are maintained constant and the tidal volume is increased from 500 to 1,000 c. c., resistance usually doubles, due to the increase in the linear velocity of the air passing through the system. An increase in respiratory rate also increases the linear velocity. Resistance is, therefore, increased if the subject breathes deeply or rapidly.

Canister shape also has considerable influence on resistance. Oblong, cylindrical, spherical and oval shaped containers induce the least, while conical shaped or narrow cylindrical shaped induce the most.[6]

Resistance to respiration if excessive, particularly that to the inspiratory phase, is believed to favor the onset of pulmonary edema. The pulmonary capillaries constrict during inspiration and cause a back pressure to develop in the venous circulation through the lungs and a transudation of fluid from these vessels.[10] On unanesthetized subjects breathing oxygen in a circle filter, the effect of gradually increasing resistance to both inspiration and expiration was to decrease the tidal volume for approximately 10-15 per cent for about ten minutes.[11] A gradual increase of respiratory rate occurred to compensate for this so that ultimately the original minute volume exchange was restored. If resistance was increased to above 15 millimeters of water the subjects complained of discomfort and dyspnea.

The extent of the "dead space" is an important feature in rebreathing appliances and deserves much consideration. The volume of gases which does not come into direct contact with the absorbent and is reinhaled without being freed of carbon dioxide is defined as "dead space." This space, perhaps best termed mechanical "dead space" since it may be increased or decreased mechanically, should not be confused with the term "dead space" used by physiologists to define space in the pharynx and trachea. The "dead space" in the "circle filter" includes the air in the mask up to the outlet tube. In the "to and fro" it includes that air in the mask up to the wire gauze of the canister and the intergranular space of exhausted absorbent beyond the gauze. In large masks this space is considerable (200 c. c.) and increases the volume of air which is rebreathed without having its carbon dioxide removed. Any tubing or connecting piece, interposed between the canister and the mask, increases this dead space. During intratracheal anesthesia, both the mechanical "dead space" and the physiologic "dead space" are decreased since the catheter dispenses with the air space of the naso-oropharynx as well as that of a mask. The purpose of the dead space in the upper respiratory tract is to prevent rapid and abrupt changes in alveolar carbon dioxide and oxygen tensions.[12] Whether or not reducing this space during intratracheal anesthesia is of clinical significance has not been determined, but no apparent deleterious effects have been noted by the numerous clinicians employing the technic. An increase in mechanical "dead space" as the result of large masks, excess tubing, etc., increases the alveolar carbon dioxide tension. In adults susceptible to slight carbon dioxide changes, this may induce respiratory and circulatory disturbances. In children even the smallest mask may increase the total dead space considerably since the pharynx and trachea are small in these subjects and the space in the mask and connecting pieces is out of proportion to the tidal volume. In addition, children may be more susceptible to carbon dioxide increases than adults, and consequently physiologic disturbances from CO_2 excess may be more frequent. Sometimes it becomes impossible to correct these disturbances and the closed system must be abandoned for the open methods of anesthesia in young subjects. The ideal anesthesia from the standpoint of minimum "dead space" is obtained during oral insufflation technics of anesthetic gases or vapors with oxygen. The "to and fro" canister may increase the dead space of the closed system as the soda lime becomes exhausted. When the tidal volume of the patient is less than the air space in the canister, the soda lime in the front half functions and is the first to become exhausted. The lime in the back portion then functions. The intergranular air space in the front then acts as a "dead space" since the gases are rebreathed without being freed of carbon dioxide. This condition is most frequently seen during anesthesia in children when large canisters such as 8x13 cm. are used. Smaller canisters should be employed (6x8 cms., or 7x12 for efficient absorption). This problem does not present itself in the "circle filter" since the pattern of absorption is different and low tidal volumes do not tend to produce "dead space."[5]

Cross infection from an infected patient to another with anesthesia apparatus is not a remote possibility. This danger may be completely eliminated by cleaning tubing, masks and connecting pieces thoroughly after use, since they are readily detached for this purpose. The canister containing absorbent is not so easily cleaned and cannot be autoclaved because of the possi-

bility of impairing the absorptive power of the soda lime. However, in the laboratory as well as clinically bacteriologic studies have shown there is no transmission of bacteria from the canisters heavily infected with colon, tubercle and other bacilli.[5] The highly caustic nature of the soda lime and the heating during absorption possibly have a germicidal effect. One can, therefore, use a canister on successive cases without fear of transmitting bacterial infection should unsuspected infection be present in a subject. One can never be over-cautious, and in the face of known infections the canister should be replaced or cleaned properly before it is used once more.

SUMMARY

The principles and features of rebreathing with the chemical absorption of carbon dioxide have been reviewed.

The physiological and economical benefits of this method are discussed. Variations in efficiency and physiologic effects due to mechanical construction are discussed.

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DISCUSSION (*Abstract*)

Dr. H. H. McCarthy, Clanton, Mo.—Anesthesia is probably the oldest phase of medicine. It is older than surgery, or at least as old, because if we go back to the time of Adam and Eve, we recall the Good Book tells us that Adam was cast into a deep sleep, and one of his ribs was removed, and that out of it Eve was created.

Dr. Harry H. McCarthy, St. Louis, Mo.—No one in this group has any doubt concerning the degree of fatigue in a normal individual which results from forced respiration for a period of fifteen to twenty minutes. Then should one be surprised if at the end of an hour or two shock is present or imminent in a surgical patient who is responding to the effect of excessive carbon dioxide inhalation with deep, rapid, respirations? This happens in many anesthesias when carbon dioxide resorption is not prevented. In addition to the fatigue, the increased respiration leads to loss of body heat and fluids, not to mention the disturbance in circulation. Sudden deaths have been attributed to the effect of excessive carbon dioxide on the circulatory system, especially in heart disease, and therefore, if not contraindicated, certainly the carbon dioxide should at least be regulated.

By their very nature, anesthetics are toxic and consequently the least amount necessary to produce a certain level of anesthesia should be introduced into the body. This is not possible if hyperpnea is permitted to exist and cause absorption of large amounts of toxic anesthetic mixtures. Of course, the factor of economy is no small item, since large amounts of anesthetics are necessary to produce a given level of anesthesia in a hyperpneic patient as compared to one with a slower respiratory rate. Hyperpnea, especially in the presence of respiratory resistance, is responsible for pulmonary edema in many cases.

Due to the fatigue, tendency to shock, excessive loss of fluids and body heat and the necessity of large amounts of toxic anesthetics the patient's convalescence is delayed. The energy expended in recovering from an exhausting anesthesia may be the determining factor in preventing recovery.

In contrast to the disabling effects of the injudicious use of carbon dioxide the importance of the gas cannot be underestimated. In addition to its indispensability in body metabolism, carbon dioxide must be used at times to stimulate respirations, particularly in deeply anesthetized patients, or in inducing very heavily premedicated individuals.

In view of the advantages and disadvantages of carbon dioxide, it is obvious that its use must be regulated to obtain a smooth, quiet, and safe anesthesia. This has been made possible by means of the soda-lime absorber. The factors influencing the efficiency of the "to and fro" and "circle" type of absorption have been discussed. Despite the increased dead space, resistance and more rapid exhaustion of the soda-lime in the "circle" type, it is probably safer and more practical than the "to and fro" technic. Another big factor in favor of the "circle" type of filter is that there is less danger of inhaling soda-lime dust particles since the distance the gases must traverse is greater and they are lost en route to the patient. The fact is made evident by examining the tubing of the apparatus. In the tubing of the "circle" type, the crypts, and corrugations and spillways contain less dust than that of the "to and fro" method. Even the mask in the "to and fro" types is often found to contain dust. The factor of irritation is important when one considers that a minute particle of soda-lime placed in the eye of a rabbit produces

total blindness. A practical point might also be mentioned at this time with reference to the exhaustion of the soda-lime. In the "circle" filter the heat of reaction in new soda-lime is greatest at the upper part of the canister and as the efficiency of the chemical decreases, the production of heat is felt to be in the more dependent portions of the container. When completely exhausted no heat is generated.

Since the soda-lime absorber is of importance in its action as a fine control in anesthesia, the work just presented by Dr. Adriani assumes paramount importance. It helps to promote the popularity of the absorption technic, but above all it removes the procedure from the realm of haphazard, empirical use to that of scientific values.

Dr. Richard D. Sanders, Louisville, Ky.—In Louisville we are handicapped by having to transport apparatus to all the hospitals in the city, about eight in number; either that, or own the apparatus in each of the hospitals. So approximately sixteen months ago it occurred to me that it would be desirable to get a smaller and more easily transported "circle filter." None was on the market, and inasmuch as it seemed that the "to-and-fro" was more efficient, I thought it wise to put a "circle" system on top of the "to-and-fro" filter, one which would allow a circling of the gases in the tube, thus eliminating the danger of dead space; also "to and fro" through the canister. It makes it possible to change canisters readily and carry very light canisters from hospital to hospital.

I have used this about fourteen months, and it appears to be very efficient. It serves the same functions as the "circle filter"; that is, it is easily applied, the weight is not on the patient's face, and there is less danger from dust and certainly less heat in the mask.

Dr. Ralph M. Tovell, Hartford, Conn.—I would like to ask whether the doctor has investigated the probability that the reduction in temperature in the "circle filter" as compared to the "to-and-fro" may be responsible for its failure to rejuvenate itself during anesthesia, and therefore its tendency to wear out first.

I have another question that has to do with resistance in "circle" filters. I wonder if Dr. Adriani has investigated the possibility of using a bellows bag such as is employed on Cornell apparatus, with a compensatory bag, to shorten the period or phase of stand-still between inspiration and expiration, and if he has tried out these two modifications of the "circle filter," and whether or not they offer any real advantage.

Dr. Adriani (closing).—One of the first things done in this study was to ascertain that the temperature of the air used to aerate the canister did not change the absorption efficiency. When air and carbon dioxide at 4, 28, 37, and 100° centigrade were passed into canisters, some slight variations were noted in the absorption but the variation is so small that it is of no clinical significance. The answer to the difference in efficiency is in the way gases are deposited in the canister. As the air comes through the tubes and valves a certain amount of friction is induced, and the force upon the granules is reduced. In the "circle filter" the granules are practically stationary during absorption. The surfaces of granules in contact with each other are not exposed to the incoming gases in the "circle filter." In the "to-and-fro" they are. There is some "swishing around" of the granules from the air currents. Absorption is entirely a surface phenomenon. There is not as much surface of absorbent exposed in a "circle filter" as there is in the "to-and-fro."

We started studies on the effect of resistance and have not had an opportunity to study the particular bag mentioned by Dr. Tovell.

The "circle filter" attachment on the top of a "to-and-fro" canister should combine the advantages of both types of units. We did some work with this, but cannot make any definite statements regarding its efficiency.

CONTINUOUS SPINAL ANESTHESIA*

By W. C. SCHAERRER, M.D.
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The continuous spinal anesthetic technic was first introduced by Lemmon[1] in 1939. It is a procedure whereby small doses of anesthetic agent are administered fractionally over a period of time, in such a manner as to afford uniform and complete anesthesia for the duration of an entire surgical procedure.

It involves the use of some special equipment: a spinal needle made of malleable metal that can be repeatedly bent at any angle without the risk of breaking; and 30 inches of rubber tubing, having a capacity of 2 c. c., fitted with Luer-Lok connections for the needle and a Luer-Lok stopcock connection for the syringe. The operating table is fitted with a pad, about five inches thick, with a part cut out at the lumbar spine. This cut out part allows the needle, which is left in place after insertion, to swing free from the mattress.[2]

TECHNIC

A Sise introducer is used to perforate the skin and through this opening the special needle is introduced into the subarachnoid space, usually at the level of the third lumbar interspace. Some practice is necessary to insert the needle without bending it, because of its malleability. A 10 c. c. Luer-Lok syringe is connected to the needle and usually 6 c. c. of spinal fluid is withdrawn. The stylet is replaced in the needle to prevent loss of additional spinal fluid. Three hundred mg. of procaine hydrochloride are dissolved in 6 c. c. of spinal fluid, thus producing a solution containing 50 mg. per c. c. The tubing is connected to the syringe and filled with the procaine

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solution to displace the air in the tubing. The other end of the tube is now connected to the needle. Thus, we have the needle in the subarachnoid space, connected by a long rubber tube to a syringe, which contains a 5 per cent solution of procaine in spinal fluid. The patient is then placed in the desired operative position, allowing the hilt of the needle and the tubing to swing into the slot of the operating table pad. Then one or two c. c. of the procaine solution is injected by opening the stopcock on the syringe and closing after the injection. The height of the anesthetic can be followed and if after ten minutes it is not high enough, more procaine solution can be injected. The force of injection will in part determine the extent of distribution, as well as the tilt of the patient, keeping in mind that the solution is hyperbaric. Anesthesia is established in a very short time, allowing the surgeon to proceed with the operation. When the patient complains of pain or pulling, an additional fraction of the procaine solution is added. From 25 to 50 mg. are usually required to produce anesthesia in 60 seconds after the patient complains.

If on the initial dose some untoward reaction takes place, much of the solution can be withdrawn, in double or more of the injected volume. This withdrawal relieves the spinal fluid of its greater concentrations of procaine and permits a rapid recovery from its influence.

During the average abdominal operation we have found it necessary to give additional procaine fractions, about every 30 to 45 minutes, each time adding anywhere from 25 to 100 mg. of procaine. Usually we add 50 mg., which is equivalent to 1 c. c. of the procaine-spinal fluid solution and add it fairly rapidly, taking two or three seconds time.

Using this technic, we have seen many cases with sensory anesthesia, but incomplete motor anesthesia. This is to be much desired in high anesthesia, as the white rami involvement usually occurs after motor paralysis.

The technic is not without its hazards and requires experience before one can familiarize oneself with the factors allowing controllability, comparable to the control of gas or ether anesthesia.

CLINICAL OBSERVATIONS

The continuous spinal anesthesia technic has been enjoying wide acceptance by competent anesthetists in outstanding clinics. In reviewing the literature on this subject, one is struck with the enthusiastic reception it is given.[4-7] The reason for this enthusiasm can readily be understood, when one stops to analyze the method and the factors involved in its use. The objection of introducing an anesthetic agent into the subarachnoid space over which no control is possible has been eliminated. Lemmon[2] reports a case, where the spinal fluid was withdrawn after anesthesia had been established and it was found that there was a return of sensation in the operative field. Anesthesia was reestablished by the reintroduction of the anesthetic-spinal fluid solution.

Another popular objection to spinal anesthesia has been the lack of control. The continuous spinal anesthetic technic allows perfect control, if the anesthetist will take the time to administer the drug carefully, observe the effects closely and stopping when the desired anesthesia has been established. The amount of anesthetic initially used to produce anesthesia should be a guide as to how much to use for the subsequent fractional dosage. We have found that if 100 mg. is used initially, subsequent additions of 25 to 50 mg. are satisfactory in upper abdominal operations and lesser amounts in lower abdominal operations. This technic takes the guess work out of spinal anesthesia and allows the anesthetist to use the minimum amount of procaine to produce the desired anesthesia. Also, the anesthesia can be continued for any reasonable length of time, without the risk of overdosage. Lemmon[2] reports that the largest dose given fractionally to any patient was 2,100 mg. of procaine for an appendectomy and excision of a left varicocele. No untoward results were reported. Ruth reports a posterior rectal resection lasting two hours and five minutes, during which time only 60 mg. of procaine was used by fractional or continuous spinal technic. Wide variations in patients' reactions and doses will be observed after one follows this technic in a few cases.

SYSTEMIC REACTIONS DURING HIGH SPINAL ANESTHESIA

The dramatic systemic reactions that are observed when a single dose anesthetic is placed in the subarachnoid space need not take place where the fractional dose administration is carried out. A relatively small initial dose is given and if the anesthesia extends high enough there will be an initial fall in the systolic blood pressure, which should not exceed 30 to 40 mm. of mercury. After this level is reached the blood pressure will level off and gradually rise 20 to 30 mm. of mercury and become stabilized at

this level unless there is traumatic surgery that causes depression. Later, when it is necessary to put more anesthetic in the subarachnoid space, it will be found not to produce as much depression as the initial dose and subsequent additions will produce less and less reaction on the blood pressure and cardiac responses. Popova[3] of Leningrad, Russia, carried out experiments upon fifty cats using procaine administered into the spinal fluid by the fractional method. He says,

"Two per cent novocaine solution used for spinal anesthesia was introduced in 7, 8, or 9 equal or rising doses in the lumbar segments of the spine. After the introduction of the first fraction the blood pressure became stabilized and responded less to repeated injections. In this manner a total dose of the anesthetic from 5 to 9 times as large as a single fatal dose was well tolerated".

These observations seem to hold true in our clinical experience. The initial period of reaction to spinal procaine, which is observed during the first 20 minutes after administration, is the most important single period during anesthesia.

It is often observed that during anesthesia there are some fairly wide swings in the blood pressure, when there is much pulling on the viscera or trauma. It is often hard to differentiate depression due to surgical trauma from depression due to anesthesia; but in observing anesthetic charts for the one-stage combined abdominal peritoneal resection of the rectum it is noted that during the abdominal part of the operation there is a variation in the systolic and diastolic blood pressure, but when the abdomen is closed and the rectal part of the work is being carried out the blood pressure usually levels out and becomes stabilized. This demonstrates the effect of abdominal surgery upon the blood pressure. Any depression in blood pressure approaching the critical level should be treated with fluids, analeptics, and oxygen as in any spinal anesthetic.

Another systemic reaction that occurs from high spinal anesthesia is that of anoxia, due to several factors. If the anesthesia extends above the sixth dorsal there is a reduction of the tidal volume of respiration. The amount of reduction will depend upon how high the anesthetic extends and the extent to which diaphragmatic excursions are interfered with due to packing off of the intestines with tapes or the Trendelenburg position. Another factor in producing anoxia is the bradycardia that occurs during high anesthesia, where the cardiac accelerator nerves are involved. This is the most serious involvement that we have to contend with in high spinal anesthesia. The reduced cardiac function causes incomplete oxygen - carbon - dioxide exchange. This together with inadequate respiratory excursions produces anoxia. Also the patient has had fairly large doses of barbiturate, which further reduces the oxygen-carrying capacity of the blood. It is no wonder that primary circulatory failure is the cause of most deaths occurring under spinal anesthesia. This whole problem may be simplified by giving the patient oxygen by mask during the operation so that one is sure he is getting at least 80 per cent oxygen during high spinal anesthesia.

Morphine should be used freely during the operation if it is time consuming and the patient becomes restless. However, one should keep in mind the depressant action of morphine on respiration.

SUMMARY

The continuous spinal anesthetic technic has had an enthusiastic reception to date, because after the routine of the technic is mastered it is no more difficult to use than the one-dose technic. It has elements of controllability that are comparable to inhalation or intravenous anesthesia. With the continuous spinal anesthetic, good relaxation can be maintained during any reasonable length of time. The surgeon does not have to hurry during the last part of an operation because the spinal anesthetic is wearing off, nor does the anesthetist have to guess what dosage to administer for a given operation. Therefore, we feel that a definite contribution has been made by it to the armamentarium of the modern anesthetist.

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DISCUSSION (*Abstract*)

Dr. Ralph R. Coffey, Kansas City, Mo.—Continuous spinal anesthetic, or I think more properly it should be

called fractional anesthesia, is one of the few things upon which Dr. Schaerrer and I thoroughly agree.

From the surgeon's standpoint, continuous or fractional anesthesia has a great many things to recommend it. Of course, the surgeon is primarily interested in two things: first, an adequate relaxation of the abdominal wall, and contraction of the viscera. He is next interested in the safety of his patient and the relative freedom from postoperative complications, at least from the use of anesthesia.

About two years ago when I first saw Dr. Lemmon doing this work in Philadelphia, I was greatly interested in it from the point of view that it lent itself readily to ease of operation, a thing, again, in which the surgeon is interested.

Of course, he talked about 1,200 milligrams of procaine hydrochloride as easily as the President talks about a billion dollars, and my eyes were sticking out. To this day, neither Dr. Schaerrer nor I use procaine as freely and as grandly as Dr. Lemmon does. At any rate, we started using it at the Kansas City General, and our experience with it has been very satisfactory.

I think Dr. Schaerrer pointed out the fact that our systemic reactions are less pronounced than with one dose spinal.

I would like to reëmphasize the fact that the use of oxygen inhalation during anesthesia apparently keeps the patient more comfortable, and I think it a good physiologic medication. I think there is a great deal of work yet to be done in research upon spinal anesthesia. Both at the Lahey Clinic and at the Mayo Clinic they are doing quite a little work on fractional anesthesia.

The Lahey Clinic, I believe, does not think there is any individual sensitivity to procaine, and they say when an individual fails to get adequate anesthesia from the average dose of procaine given intraspinally, there is some error in the technic.

I do not think that is so. I think that our own observations very definitely tell us that there is the same range of individual sensitivity to procaine that there is to many other drugs.

Lemmon, I know, has given as much as 400 to 500 milligrams of procaine before he has attained the amount of anesthesia that he wished. We have never gone as far as that. I will quit before I do that. I have not sufficient steel in my blood. However, when you look at it, there are only about 10 milligrams of procaine to a c. c. of spinal fluid or any other fluid in the 1 per cent solution, so in an ounce of 1 per cent there would be 300 milligrams.

Of course, in the infiltration anesthesia, we many times use a great deal more than that in infiltrating subcutaneous tissues. I wonder if there have been any figures on the volume of space in the subarachnoid space of various individuals.

If there is a difference, if we inject a 5 per cent solution such as is made up in fractional spinal anesthesia, into a large subarachnoid space, we immediately have a greater dilution of fluid than we do in an individual with a small build, with a relatively small amount of fluid present to dilute the injected fluid.

Another thought occurs to me, what is the effect of long continued bathing of the spinal cord and the roots with various dilutions of procaine?

In our own experience, we have had no great amount of difficulty with fractional spinal anesthesia. We have been greatly impressed by the ease of manipulation of tissues throughout operation no matter how long, and as our experience goes on with the use of this type of anesthesia, we become more and more enthusiastic about it. I believe that it is going to have a wider field of application.

Dr. A. A. Brindley, Toledo, O.—I have been told that the Committee for the Study of Anesthetic Deaths in the City of Philadelphia reported for the year 1939 and 1940 that the total number of anesthetic deaths was 239; that of those deaths, 176 were spinal, due to spinal anesthesia. What part the introduction of continuous spinal anesthesia had in that rate, I do not know.

At the outset of the work being done on fractional spinal anesthesia, we were told that it reduced the dose, reduced the amount of anesthetic necessary for the production of spinal anesthesia. Certainly, at least in my memory, I do not recall men who were early workers in the field of spinal using 400 and 500 milligrams of procaine in the production of the first stage of anesthetic. I mean by that, that 150 or 200 milligrams at the outside was the top dose for the introduction of spinal anesthesia, is not that true?

Dr. Ralph M. Tovell, Hartford, Conn.—Yes.

Dr. Brindley.—I remember we were told some years ago by men who did spinal anesthesia, Babcock, who has probably done more than all the rest of us put together, that 100 to 125 milligrams was all that was needed for almost any type of work.

I cannot speak with authority on procaine because over a great number of years I have used pontocaine with much success. When you get an old pair of shoes that fit you, you keep on wearing them. That is the reason I have not changed.

But there must be some reason for the introduction of fractional spinal anesthesia, and certainly if the picture of the death rate in Philadelphia is true, that is not the reason. I know that at the American Medical Association in Cleveland, Dr. Eversole had a setup on spinal anesthesia, and he told me at that time that they were able to continue for a period of four or five hours. If I correctly understood him, his main reason for using fractional spinal anesthesia was the time element, for operations requiring a long period of time.

Fortunately, I am not bothered by that sort of thing, and do not have to worry my head about it, but where it is a requisite, I should think fractional anesthesia would be the anesthetic of choice if one were going to use spinal.

Dr. H. H. McCarthy, Clayton, Mo.—In using continuous spinal anesthesia it would seem that the additional apparatus such as the special type of needle, the long tubing which leads from the needle to the head of the table, the syringe, and so forth, offers that much more opportunity for contamination. Especially is this true if the opportunity for contamination continues throughout an hour or two of surgery. Thus, it increases the greatest danger in spinal anesthesia, that of meningitis.

Secondly, in the patient who is restless, nervous and perhaps nauseated and vomiting, I believe there would

be great difficulty in keeping an intact passageway from the syringe to the subarachnoid space.

Thirdly, it seems evident that in continuous spinal anesthesia both the surgeon and the anesthetist are at a distinct disadvantage. It would be difficult for the surgeon to employ the Trendelenburg position to obtain proper exposure and to pack off the bowel, and difficult for the anesthetist if urgent, anti-shock measures are necessary. It would be dangerous to place the patient in such a position soon after administering a fractional dose of a hyperbaric solution. Could this danger be obviated by using a hypobaric solution such as pontocaine? The patient could be placed in a modified Trendelenburg position at the onset of the procedure. As fractional doses of the solution are added, it would tend to diffuse upward rather than downward, that is, cephalad, and thus allow greater control of anesthesia level and consequently decrease the danger of respiratory paralysis. Has such a procedure been used?

Dr. Tovell.—On the basis of what Dr. Henry Ruth has told me of his experience with continuous spinal, I would like to make a plea for the use of small doses and weak solutions. He has found, for instance, that a 3 per cent concentration containing 30 milligrams per c. c. is perfectly adequate for the production of good surgical anesthesia, and does make it possible to reduce the dose very materially.

I think, too, that it is well to limit your choice of continuous spinal to those patients to whom you would be willing to give a single dose spinal and not extend the limit of usability of spinal anesthesia by the new method.

I think there is an inherent danger. We will think that because it is so safe, it will be extended to those patients who should never have received spinal in the first place.

Dr. Schaerrer (closing).—In answer to the question about the dosage or quantity of procaine required for a given operation, I would like to state that here lives the stimulus that created the continuous spinal anesthetic technic. Any variation of time and dosage can be fairly accurately controlled. Many deaths have occurred under spinal anesthesia because the estimated dose was an overdose. Many failures to produce anesthesia have occurred because the estimated dose was an under dose. The continuous or fractional method allows small doses to be given fractionally until satisfactory anesthesia is obtained.

With regard to the contamination of apparatus: this factor must be kept in mind and the anesthetist should be able to carry out a sterile procedure as easily as the surgeon. I have had no difficulty with this factor.

There was a question referring to the use of longer acting anesthetic agents. I believe what we need for this technic is an agent that is shorter acting and allows more controllability, because the effects of a given dose would last only a short time. Also, it may be that a weaker anesthetic agent will anesthetize the posterior or sensory roots only and exert little or no effect on the motor or vasomotor roots.

The indications for the continuous spinal anesthetic are exactly the same as the indications for any spinal anesthetic: in general, the patient should be a moderate to a good risk.

X-RAY THERAPY IN SUPERFICIAL INFECTIONS*

By C. M. Hamilton, M.D.
Nashville, Tennessee

It is not the purpose of this paper to advocate the use of radiation therapy in acute superficial infection to the exclusion of chemotherapy and other measures of sound medical and surgical care. A meager knowledge of the helpful influence of radiation in infections dates back to 1902. Since that time many experiments and clinical observations have been reported; however, this means of therapy has not met with the widespread use that it merits.

Acute infections respond to small amounts of irradiation. The more acute the infection, the smaller the amount of rays necessary. Therefore, radiation should be recognized as a harmless agent with great potentiality and its range of application should be widened. Sulfonamides are indicated in severe infection, but since they may cause objectionable reactions, cutaneous eruptions and critical blood disorders, a harmless agent without ill effect should be more universally employed.

Irradiation in small doses has no bactericidal action upon laboratory cultures, but has a decided inhibitory influence on bacteria in living tissue. This is probably due to an indirect effect caused by cellular changes. Each type of tissue seems to vary in its susceptibility to radiotherapy. Certain cells are extremely sensitive to small doses, while others are resistant to large amounts. Lymphocytes are very sensitive to radiation and cell destruction has been observed within fifteen minutes. Polymorphonuclears and eosinophils are rather sensitive but do not begin to disintegrate for ten to twelve hours. Leukocytic disintegration continues rapidly for two or three days and to a lesser degree for three or four weeks. Lymphoid cells are found abundantly in acute infiltrative inflammatory processes and in the adjacent circulating blood vessels. The beneficial effect of radiation is probably due to destruction of these sensitive cells. Disruption of a protective mechanism against infection may seem detrimental rather than helpful, but radiation only facilitates natural changes. Cellular disintegration liberates antibodies, ferments, and other protective materials stored within. These

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bactericidal substances become mixed with the tissue fluids in the surrounding interspaces and are available for defensive purposes. An increase in phagocytosis by the reticular cells has also been recognized.

The most outstanding results have occurred in early infective processes. Acute furuncles, carbuncles, lymphangitis, and other localized inflammatory conditions may undergo resolution without suppuration, thus obviating the necessity of mutilating incisions that leave ugly scars. In late inflammatory conditions, after necrosis begins, x-rays increase tissue disintegration, which causes a noticeable increase in drainage and a more rapid healing. Pain is usually relieved within four to eight hours and if drainage is necessary it can be done much sooner. DesJardins says:

"Anyone who has had extended experience with radiotherapy for acute inflammations cannot fail to have been impressed by the prompt relief of pain and rapid resolution of lesions when treated early; or acceleration of suppuration in lesions treated later; by the fact that acute inflammations of various kinds respond at about the same rate to a given dose when treated at a corresponding state; and by the fact that a small dose of rays is sufficient to produce this effect."

The response of infection to radiation is in direct proportion to the amount of leukocytic infiltration and inversely proportional to the amount of connective tissue proliferation. Infection involving connective tissue and the deeper fascial planes is helped but little.

Small doses are preferable to large doses and soft rays are more desirable than hard rays. An application of 75 to 125 r. of x-rays, using 90 kv. and one millimeter of aluminum filter at ten inches distance, every other day for four treatments is very satisfactory in deeper lesions; whereas, single doses of unfiltered rays are best suited for superficial. The field of therapy should extend well beyond the surrounding edges. This method does not produce an erythema or cause objectionable after effects. A large carbuncle has been observed which disappeared from the back of a man's neck without incision. Recurring furuncles in the axillae have responded in a most gratifying manner. Radiation increases the suppuration of old lesions and may abort early lesions in the formative stage. Tularemia has been favorably influenced by a single suberythema application of unfiltered radiation to the local lesion and by repeated doses of moderately filtered therapy to the associated adenopathy. A limited number of cases of localized erysipelas has seemingly been benefited. Potentially serious infections about the nose and upper lip are favorably affected. Secondary infection in dermatomycosis of the feet, infectious eczematoid dermatitis, impetigo contagiosa, and ecthyma are benefited by a single exposure of unfiltered rays in doses of 100 to 125 r. In treating folliculitis and pustular lesions of the scalp, the well known "five point" technic may be used, but the operator should be mindful of the dangers of producing alopecia. Various simple herpetic lesions can be rendered less painful and probably caused to undergo resolution more quickly by a fractional dose of unfiltered therapy. The vesicles of herpes zoster seem to subside more quickly after small doses of unfiltered rays and the intercurrent painful neuritis can be relieved by 200 to 250 r. of x-rays filtered through two millimeters of aluminum applied to the corresponding segmental nerve roots. Granuloma pyogenicum and other lesions of a more chronic nature require heavier dosage. A pyogenic granuloma can be destroyed with one application of unfiltered rays totalling 700 to 800 r. Paronychia is usually relieved by small doses of unfiltered irradiation weekly or biweekly when supplemented by local antiseptics.

In conclusion, the following points should be re-emphasized: Radiation therapy has not gained the headway that it deserves. It is a harmless life-saving procedure which may prevent general septicemia and other serious complications. Treatment should be done early to obtain the best results, but therapy in the late stages may be worth while. Radiation does not interfere with other means of combating infection, but on the contrary is a valuable adjunct. Large doses are unnecessary.

CONTACT X-RAY THERAPY*

By W. Leslie Kirby, B.S., M.D.
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By contact x-ray therapy we mean the employment of a short anode-skin distance of 2 to 8 cm. The development of this method of therapy has been made possible by the availability of shock-proof equipment, and has followed a logical sequence of events over the past twenty years. We shall briefly review these events.

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Regaud of Radium Institute in Paris demonstrated in 1921 that protracting the treatment period with radium over a period of several days gave a better effect as to destruction of malignant tissue and salvaging of normal adjacent tissues. This prolonged treatment period was accomplished by the use of small units of radium, highly filtered, well distributed in or upon the lesion; thus giving a fractional daily dose.

A little later Coutard began utilizing the same principles in high-voltage x-ray therapy. Using high filtration, he delivered a fractional dose daily for twenty to thirty days or longer, securing a heavy cumulative dose in the tissues. Although the total dosage was larger than that previously given by the massive single dose method, the skin reactions were milder and more predictable. Deep sloughing of tissues was avoided entirely. His success, especially in laryngeal carcinoma, with the protracted fractionated method is well known and many therapists now use this plan or a modification of it.

In the effort to develop a substitute for radium therapy, since this element was very scarce in Germany, Schaefer and Witte[1] in 1929 constructed a special type of shock-proof x-ray tube for intravaginal treatment of cancer of the cervix. This type of tube was improved in 1931 by Chaoul and used in treating superficial lesions. The method became known as "Chaoul therapy" or "contact x-ray therapy." In Chaoul therapy low voltage is used, 50 to 60 kilovolts, and a short anode-skin distance of 2 to 10 cm.

Chaoul and Adam[2] reasoned that the amount of irradiation absorbed by tissue was responsible for the biological effect, and that this was not dependent upon the wave length or quality of the irradiation. They based these conclusions on the experimental work of Holthusen and others who demonstrated that as long as the quantity of irradiation absorbed by human tissue or ascaris eggs remained the same, the biological effects were identical regardless of the quality of the ray. For example, the biological effects of equal tissue doses of 30 kilovolt unfiltered x-ray and gamma radium rays were found by Holthusen to be identical.

Chaoul's[2] explanation for the superiority of radium over x-ray in treating certain superficial lesions was the fact that the source of the rays in radium was near the surface and the law of inverse squares operated to decrease the dose in the tissue rapidly, whereas, the dose just beneath the surface was high. This, he felt, spared the "tumor bed," composed of the normal subjacent connective and vascular tissue. He believed that absorption by the superficial tissues of most of the rays from x-ray could likewise be brought about by using low voltage and shortening the anode-skin distance.

The proportional amount of radiation at a given depth below the surface, to that of the skin may be varied by the technic factors. This proportionality is termed the percentage depth dose; it is determined by the kilovoltage, filter, target-skin distance, and the size of the treatment area. The radiologist has made use of higher voltage, higher filtration, greater anode-skin distance, smaller treatment fields, and cross-firing in order to secure a greater depth dose. The development of higher powered equipment has aided him materially in this objective. Conversely the dermatologist is interested in delivering most of the depth dose within a few millimeters of the surface. Therefore, lower kilovoltage, little or no filtration, and the minimum distance which the equipment would permit, have been utilized. The advent of shock-proof equipment has made possible the use of much shorter anode-skin distances, especially for small fields. With this short distance technic, larger doses can safely be given since the percentage depth dose falls off rapidly. The dosage in epitheliomas can be heavy near the surface where it is needed, and the tissues below the growth can be spared. Late radiation ulcers and fibrosis are the result of damage to the normal vascular bed and connective tissue elements below the lesion; atrophy and telangiectasis are secondary changes resulting from this damage. It is not intended to suggest that all such damage can be avoided; but surely any technic which places more of the ray absorption in the superficial tissues will tend to minimize this damage to deeper tissues.

A secondary and less important factor is the increase in intensity or roentgen output brought about by decreasing the distance, although using comparatively low kilovoltage. This permits rapid treatment of lesions where immobilization is difficult, for example, angiomas in infants.

The first experiments by Chaoul[2] and Adam in 1931 were done with a shock-proof superficial therapy tube operating at 43 kilovolts and a distance of 5 to 8 centimeters. The reports covering these experiments appeared in the literature in 1933, and subsequent articles came out in the two succeeding years.[3,4]

In the fall of 1935, having added to our equipment a shock-proof superficial therapy machine, we decided to use a modification of Chaoul's

technic in treating skin cancer. The tube housing on our machine permits a focal skin distance of 6 cm. At 80 kilovolts and 5 milliamperes, the roentgen output is 940 r. per minute measured in air.

The plan of treatment for basal cell cancer is to screen the lesion with lead foil of 1 millimeter thickness, allowing ½ cm. margin of normal tissue and to treat the lesion every other day. Six to eight treatments of 940 r. each are usually given. If the lesion is elevated more than 5 millimeters the first three doses are usually 1,400 r.

Paradoxically the larger the area the less the dose required, owing to the increase in dosage from back scattering of the rays and increased biological effect. For example, 900 r. is required to produce an erythema of a field 1 cm. in diameter, whereas, a field 4 cm. in diameter receives an erythema dose from 300 r. Some of the larger lesions (3 to 4 cm. in diameter) are given only 550 r. per dose. The lesions begin to regress after the second treatment. By the time the last treatment is given, a sharp erythema is visible on most individuals. Very old patients with a dry, leathery skin show no reaction until four or five days after the treatment is concluded. There is a moist epidermitis about one week after the treatment is finished which persists from one to three weeks, depending on the size of the area treated; larger lesions are more reactive and slower to heal.

Plantar warts are treated by this method, using 1,800 r. at one treatment for those 6 millimeters or less in diameter. Usually one treatment is sufficient and five or six lesions can be treated within fifteen minutes. Pain is relieved within a

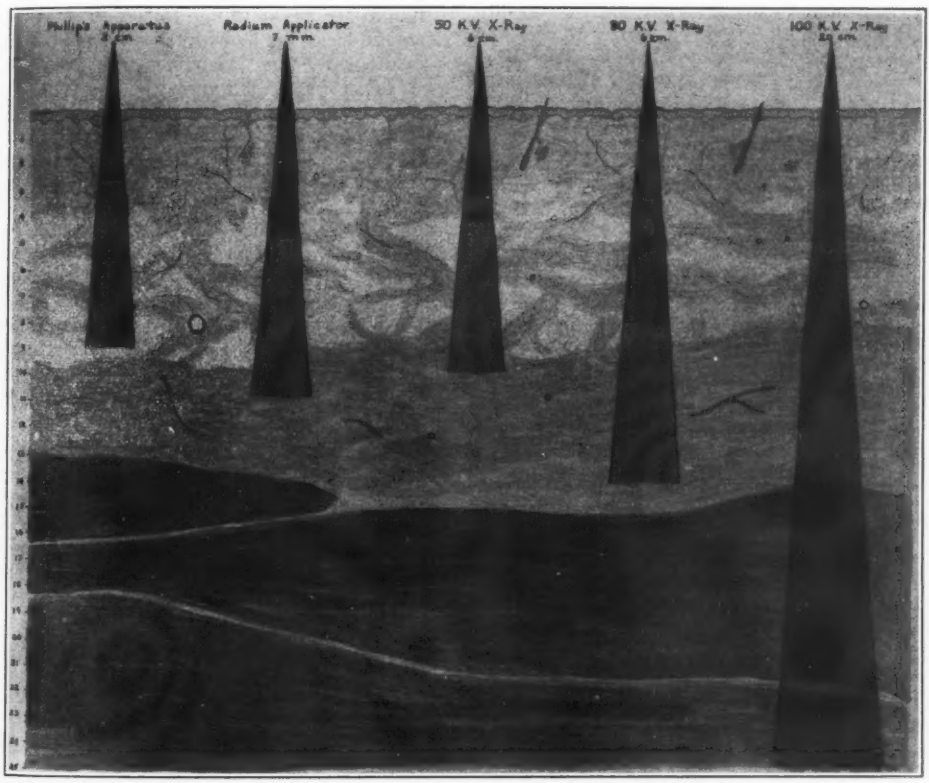

Fig. 1

Diagram of skin and superficial tissues to a depth of 2.5 cm. Scale 1:16.
Upper segment, darker color = depth dose above 50 per cent. Lower segment, lighter color = depth dose 25-50 per cent.

COMPARATIVE DEPTH DOSAGE

Chart showing percentage depth dose of irradiation in the skin and superficial tissues with different technics.

	1	2	3	4	5
Source of Irradiation	Phillip's Contact Therapy X-Ray	Radium Surface Applicator	Shockproof Superficial X-Ray	Shockproof Superficial X-Ray	Shockproof Superficial X-Ray
Kilovoltage	53 K. V.		50 K. V.	80 K. V.	100 K. V.
Filter	Inherent	1 mm. brass	Inherent	Inherent	Inherent
H. V. L.	0.3 mm. al.	4 mm. al.	0.4 mm. al.	0.7 mm. al.	1 mm. al.
Distance	2 Cm.	7 mm.	6 Cm.	6 Cm.	20 Cm.
Surface dosage per cent	100	100	100	100	100
Depth dosage per cent 1 Cm.	22	29	28	38	55
2 Cm.	8	13.1	11.4	18	32.6

Table 1

PRACTICAL APPLICATION OF CONTACT X-RAY THERAPY

Comparison of 100 K.V. conventional technic with 50 K.V. contact x-ray technic.

(1) Given a patient with a basal cell epithelioma of the nose 1 centimeter in diameter with a depth estimated clinically at 1 centimeter.

(2) Let us say we wish to deliver no less than 2,400 r. to any portion, especially the lowermost cells of this lesion.

(3) Now let us compare the surface dosage required, and the depth dosages obtained in treating the tumor with two different technics.

	100 K. V.—20 Cm.		50 K. V.—6 Cm.	
	Pct.	r.	Pct.	r.
Surface dose	100	4,363	100	8,571
1 cm. depth	55	2,400	28	2,400
2 cm. depth	32.6	1,423	11.4	977
4 cm. depth	14	611	3.8	325
Radiation absorbed in 1 cm. of tissue	45	1,963	72	6.171

Table 2

few days. No reactions of any consequence have occurred.

Angiomas in infants, in our experience, respond just as well to contact therapy as to radium. The dosage ranges from 200 r. for a lesion 3 cm. in diameter to 450 r. for a lesion 1 cm. in diameter or less, and the treatment is given in 12 to 25 seconds. Angiomas are treated at intervals of four to six weeks in order to obtain as much effect as possible before subsequent treatment is given. Four to six such treatments are usually required to eradicate the lesion.

Before we began using this method, we occasionally had the unhappy experience of having a patient return in about a year after treatment of an epithelioma with an ulcer at the site of treatment. These cases presented a problem as to whether the ulcer was due to regrowth of malignant cells or was a late roentgen ulcer. Biopsy in these cases invariably showed fibrosis at the base of the ulcer and obliterative endarteritis along with development of many newly formed blood vessels. Some of these cases also showed about the edges of the ulcer active cancer cells. Necrosis of cartilage of the ears or nose beneath the treated area was not an unusual occurrence. This meant we were getting too much irradiation effect below the tumor, and yet sometimes not enough in the tumor itself.

Since adopting the present technic in 1935, we have not had any late roentgen ulcers, nor any necrosis of cartilage of the nose or ears. Our cosmetic results, especially in lesions of the lids and nose, have been much more satisfactory. Recurrences are much less frequent than when we used 20 cm. distance, even though many cases were formerly treated by electro-desiccation and x-ray.

It has been known for years that basal cell cancer responds to smaller dosage than squamous cell cancer and sweat gland adenocarcinoma. Sometimes in early lesions it is impossible to differentiate these lesions clinically. Since, with the plan of treatment outlined above, it is safe to use doses sufficiently large to cure the more resistant types of cancer, one feels more secure in carrying out the treatment regardless of the

biopsy findings. As a precaution in lower lip cancer which is practically always squamous cell, we have used a little higher dosage than the routine for skin cancer. The tumor is treated alternately on skin and mucous membrane surfaces, with a dose of 900 to 1,200 r. daily for eight days, a total of 7,200 to 9,600 r. This produces a moist desquamative epithelitis which appears on the mucous membrane at the sixth day and an epidermitis on the skin side at the eighth to tenth day. Exudation and crusting on the skin side persist for fourteen to twenty-one days and healing is usually complete by the twenty-eighth day. The resulting scar is smooth and pliable, giving a very satisfactory cosmetic result.

SUMMARY

(1) We feel that for the dermatologist who has little need for intracavity irradiation, the conventional shock-proof superficial tube which permits a focal skin distance of 5 to 8 cm. is satisfactory for contact therapy.

(2) Contact x-ray therapy is a satisfactory substitute for external radium therapy, since most authorities now agree that our good results with radium in the past have been due not to its shorter wave length irradiation or some mysterious quality of its rays, but to a better distribution of the irradiation in the affected tissue brought about by its closer application or shorter focal skin distance.

(3) Contact therapy in our experience can be used in cancerocidal doses with safety and assurance as to cure and cosmetic results. Because of the effective distribution and absorption of the rays in the tumor, damage to the underlying structures is reduced to a minimum.

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DISCUSSION (*Abstract*)

Dr. Garold V. Stryker, St. Louis, Mo.—The development of the shock-proof tube has produced a decided change in the technic of x ray therapy.

By this method we are approaching what we have been using and doing for a great while with radium. The technic is called contact therapy, which it is not at all. As Dr. Kirby showed you, his distance is still six centimeters from the patient. That is not contact therapy. It is therapy in which the anode is closer to the tissue than has been possible before, and it gives us a sense of security and makes us feel that we are actually putting the x-ray right down on the lesion.

I would like to compare x-ray therapy at a distance of six centimeters with radium. On Dr. Kirby's charts, if you noticed, there was an allowance of seven millimeters distance in his radium application. It has been my practice, at any rate, to place my radium in much closer contact to the tumor than seven millimeters. In fact, with the use of platinum tubes of 0.5 millimeters thickness, it is possible to get radium down pretty close to the tumor even if it is placed on the surface.

There is no doubt, however, that contact x-ray therapy has been a decided advance in certain instances, and it has changed the cosmetic effect considerably. It is just a question in my mind as to whether we are doing the right thing in thinking so seriously of the cosmetic effect when we are treating something like carcinoma, which has great potentialities.

We must consider that we are dealing with treatment of rather minute areas. Rarely are we considering anything over three or four centimeters in diameter, so that this therapy is not applicable to general radiation of the body.

The question of roentgen ulcers as a sequel is a serious one, and I think they are usually due to a failure in technic. In the proper and thorough treatment of cutaneous lesions with radiation, the appearance of late roentgen ulcers today is not a common experience. In the past this was not true.

We certainly are indebted to this technic for the treatment of plantar warts. I believe it has been a distinct advantage and great help. The larger dosage which we have been able to administer at the depth of a plantar wart, a benign neoplasm, which is usually far harder to eradicate than many malignant ones is, in my opinion, the greatest advance.

The adaptability of the machine is another thing which, I think, has to be taken into consideration. In other words, having used radium over a long period of time in small containers, I find that it is rather difficult for me to adapt an x-ray tube to a small place such as a nasolobial fold, or the eyelids, the inner canthi, the perianal and inguinal region.

It is necessary for the dermatologist to be thoroughly and adequately prepared to use both x-ray and radium efficiently.

Dr. George Clinton Andrews, New York, N. Y.—The most important thing that Dr. Kirby has brought out is the effort to get the maximum absorption of radiant energy at the site of the pathologic process, usually 5 to 10 millimeters below the surface; and the protection of underlying structures by keeping away unnecessary radiation.

I am interested in a comparison of the results of this type of treatment with those of the old conventional treatment. At the Vanderbilt Clinic in New York, we have during the past several years had two of the contact machines and three of the old 100 kv. machines and one 200 kv. high voltage apparatus and one grenz ray machine in constant use. The grenz ray is not of much use for anything because of lack of penetration. The results from the contact therapy I do not say are

better than results from the old method of therapy. They may be slightly better in some cases, but not strikingly. I do not think you should feel that you have to throw out your old apparatus and get a contact therapy machine. There are definite advantages in some cases, but the old apparatus running at 90-100 kv. is quite as good. In some cases I still prefer the 200 kv. apparatus and a filter of a quarter millimeter of copper and two millimeters aluminum in divided doses of 300 r. daily, which is one-half an erythema dose, for eight days. This series may be repeated. The results from this high voltage method are better than contact therapy with low voltage in some cases.

I still prefer radium treatment for angiomas, using, however, radium at a distance of one centimeter and heavily filtered through two millimeters of brass or half a millimeter of platinum, or interstitial therapy, putting small needles or gold implants into the lesion.

I would just like to say in passing that on plantar warts Dr. Barnes and I have been using fractional, divided treatment with greater success than we have had with a single heavy dose. We give 1,000 r. once a week for three treatments at 50 kv. with the contact therapy apparatus, or 750 r. filtered through three millimeters of aluminum weekly for three treatments at 135 kv. with the old type of apparatus.

On epitheliomas, our doses are about the same as those of Dr. Kirby. We give usually 8,000 r. at 50 kv. with contact therapy apparatus, dividing our doses differently, 1,000 r. twice a week for four weeks. This dosage seems to be equivalent to 750 r. twice weekly for 4 weeks, making a total of 6,000 r. unfiltered at 90 kv. with the old type apparatus. These doses are modified often according to the size of the lesion, its location, and the age of the patient. It does not apparently make any difference how you divide the dose as long as you get it all in within a relatively short time before the vascular bed of the tumor is destroyed. The reason we got into trouble with the old method of treatment is that we gave small doses over a long time or allowed an interval to elapse between large doses, and the interval would be so long that the tumor bed would be seriously injured by the radiation so that subsequent doses would cause necrosis.

I would like to refer to the original work by Dr. Carl Braestrup and myself, published in the Archives of Dermatology and Syphilology, March, 1936 (Vol. 33, pp. 446-454) on the depth dosage measurements in millimeters below the surface of the skin, which were the first measurements of that type made in this country, and to the inclined film technic which we used in that paper, which I believe is more accurate and reliable and free from error than either of the methods mentioned by Dr. Kirby.

This paper suggested, "It may be advantageous to experiment with voltages intermediary between those now used in roentgen and those used in grenz ray therapy, with the hope of obtaining a quality of radiation of greater homogeneity, which will be more uniformly absorbed in the first few millimeters of skin and yet will be of such low penetrability that the rays are completely absorbed within the zone of the pathologic process, which we judge to be rarely more than 1 or 2 cm. in depth."

We did preliminary work along these lines, and noted that x-rays produced with the conventional equipment used for dermatologic therapy, employing from 40 to 50 kilovolts, were practically absorbed in the first 1 or 2 cm. of tissue. This estimate assumed homogeneous radiation of an effective wave length of 0.9 angstrom, which gives 18 per cent absorption in the first millimeter and 87 per cent absorption in the first centimeter of skin. These suggestions were the first of the kind made so far as I have been able to learn.

Dr. Kirby (closing).—I certainly agree with Dr. Stryker that contact x-ray therapy has no advantage over radium and that if one really wants to deliver most of the dosage within the first two or three millimeters of tissue, then radium is certainly the best means of all, using just enough filtration to take out the softer beta rays and placing the applicator as close to the skin as possible. It is probable that for lesions of the eyelids and ears where the cartilage is near the surface, radium is still the method of choice.

We ordinarily use contact x-ray therapy for epitheliomas, plantar warts, keloids, and angiomas, lesions which, as a rule, do not cover a large surface. Dr. Stryker is certainly correct in saying that one would encounter considerable difficulty in treating any very large area by this method.

Of course, strictly, it is not contact therapy. The tube housing is in contact with the lead foil, however, on the surface of the area being treated. The lead foil is first localized about the lesion, leaving a healthy margin of tissue, and then the tube is brought down firmly and anchored so there is no likelihood of motion. We do not find any necessity for the use of periscopic vision in treating lesions by this method.

We have a clinic up in the mountains some fifty miles from Winston-Salem where we are using the conventional x-ray technic. We find the fractional dosage method advantageous with this technic, but it is necessary to keep the dosage a little lower. Using 100 kv. and 8-inch distance, we give 450 to 600 r. per dose and treat the lesions every other day for about eight treatments so that the total dosage runs from 3,600 to 4,800 r. However, we find that we can give around 2,000 to 4,000 more r. using the low-voltage contact method than we can by using the conventional technic, and we feel that it is safer, too, even though we are using a larger dosage.

I do not feel that this particular method is suitable for treating superficial infections such as furuncles and carbuncles. In lesions of this type one wishes to deliver a uniform dosage throughout the depth of the affected tissue With the contact method one gets absorption of a lot of the dosage in the first millimeter or two of skin. Therefore, we use the conventional plan of treatment, usually with filtration, in the treatment of infections. The dosage is small, running from 50 r. in the acute condition to 100 r. in the more chronic lesions so that the depth dose below the lesion needs no consideration. Furthermore, these lesions usually do not have to be treated more than two or three times anyway.

In going over the literature while preparing this paper, I read Dr. Andrews' article upon the measurement of depth dose of superficial therapy by an inclined plane of x-ray film. However, I did not understand the details sufficiently well to compare his measurements with the cylinder of water technic used by Cipallaro. I hope we shall be able to make this comparison later on.

SUBACUTE CATARRHAL OTITIS MEDIA AND MASTOIDITIS WITH EFFUSION*

A SYMPTOM AND A CLINICAL ENTITY

By J. MATHEWS ROBISON, M.D.†
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Considerable attention has been given to this disease in medical literature under a number of synonyms such as catarrh of the tympanic cavity and eustachian tube, seromucous middle ear catarrh, otitis media serosa, exudative catarrh, and others. For the purpose of considering this disease in some of its various forms and in orderly fashion a classification is offered based upon the presence or absence of coexisting disease in the nose, sinuses, or nasopharynx, which may have a bearing upon its incidence, course and termination.

In order to localize better this particular condition we will first consider:

(A) Acute catarrhal otitis media and mastoiditis with effusion.

This form of the disease is so often seen as a symptom of a coexisting upper respiratory infection and its course and termination are so well understood that we will pass over it with the following observations:

(1) The acute form may not always go on to suppuration or resolution. Instead the fluid in the mastoid cells and middle ear may remain for a varying time, resulting in the subacute and later the chronic form with definite permanent impairment in hearing.

(2) The pharyngeal orifice of the eustachian tube shares in the inflammatory reaction of the nasopharyngeal tissues during an acute infection and no doubt this closing of the pharyngeal orifice is frequently responsible for the effusion of fluid into the middle ear, particularly during intense inflammation. However, patients are also frequently encountered who, while suffering from an acute respiratory process, have symptoms of obstruction of the eustachian tube which may vary from a sense of fullness and popping in the ears with slight hyperemia of the drum membrane to complete retraction of the tympanic membrane with effusion of fluid into the tympanum without having sufficient swelling in the mucous membrane of the pharyngeal orifice of the eustachian tube to close it.

This would lead one to believe that the eustachian tube may be closed somewhere between its pharyngeal orifice and isthmus by external pressure such as may be derived from a swollen lymph node.

(3) During acute purulent otitis media and mastoiditis, involvement of the deep cervical lymphatics always seems to delay the termination of the disease.

(B) Subacute catarrhal otitis media and mastoiditis with effusion.

In type 1 effusion appears to be a symptom.

This group of cases always has a pathologic condition which can be demonstrated in the nose, sinuses or nasopharynx, and the ear symptoms usually disappear when the disease in one or more of these areas has been corrected. The effusion of fluid into the tympanum may or may not be continuous with the acute process in the sinuses or nasopharynx and it frequently does not occur until some days or weeks after the acute condition has terminated or has become subacute.

The ear symptoms, namely, the sense of fullness in the ear and impaired hearing, usually bring the patient to the otologist instead of symptoms derived from disturbance in the sinuses or nasopharynx.

From an etiologic standpoint the most frequent causes of this type of effusion are:

(1) Acute or subacute infection of the adenoid with or without hypertrophy.

(2) Infection in one or more of the sinuses, the maxillary being by far the most frequent offender and the sphenoid next in importance.

(3) The infected faucial tonsil has been credited by some authors with producing stenosis of the eustachian tube by its influence on the palato-pharyngeus muscle in the posterial faucial pillar which aids in opening the pharyngeal orifice of the tube.

(4) In addition to disease in the sinuses, nasopharynx and ear, these patients present, if an enlarged adenoid does not completely obliterate the pharyngeal opening from view, a slight or aggravated edema of the pharyngeal orifice of the tube and frequently an obliteration of the

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fossa of Rosenmueller. This edema is usually more intense in the presence of an adenoid infection. However, though it may have sufficient inflammatory characteristics, it is also contributed to by the peri-tubal plexus of lymph vessels. These collect the lymph from the eustachian tube, nose, sinuses and nasopharynx and go through the pharyngeal aponeurosis around the tube to enter the lateral chain of retropharyngeal lymph nodes. The latter nodes may block the eustachian tube by exerting external pressure on the tube when they are involved, or they may when swollen block the flow of lymph and cause an edema of the mucosa of the eustachian tube.

In type 2, the effusion appears as a clinical entity.

This group of cases shows no disease in the nose, sinuses or nasopharynx. The patient usually consults the otologist complaining of a sense of fullness in one ear, reverberation of his own voice in the affected ear, tinnitus and a certain degree of deafness. Examination of the tympanum reveals it to be entirely or partly filled with fluid which is seen through a retracted drum devoid of any acute inflammatory process. The drum frequently has a dark bluish or slightly yellow color due to the color of the fluid in the tympanum and passive congestion. The pharyngeal orifice of the eustachian appears normal in color and contour and its motion during swallowing is normal. There is no edema or inflammatory change in the mucous membrane of the tubal orifice.

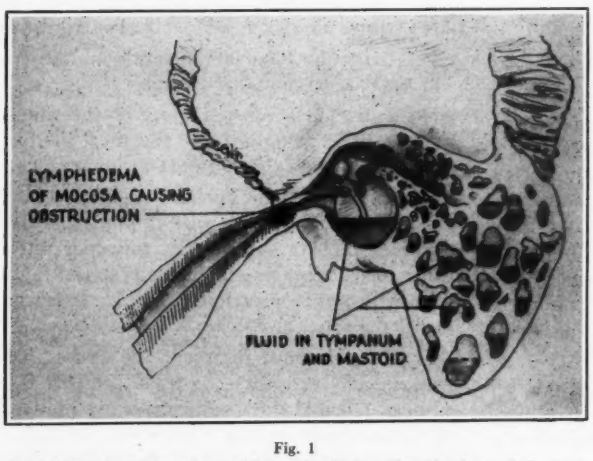

Fig. 1

Catarrhal otitis media and mastoiditis with effusion. Lymph edema of the mucosa of the eustachian tube leads to tubal stenosis and effusion of fluid into the tympanum and mastoid cells.

When an attempt is made to inflate the tube, however, it is usually found to be partly closed. If the symptoms are of very recent origin, a bougie can usually be passed by the obstruction in the tube very easily, but if the obstruction is of long duration it may be dilated only with difficulty.

This condition then would seem to be an idiopathic closure of the eustachian tube with an effusion of fluid into the middle ear and mastoid cavities. These patients have no symptoms of acute inflammation: neither fever nor pain in the ear nor tenderness over the mastoid. Termination occurs after a varying length of time either in a spontaneous return to patency of the eustachian tube and an absorption of the effusion with a return of the hearing, or if the tube remains closed long enough and organization occurs in the fluid, the adhesive processes between the drum promontory and ossicles occur, with which we are all familiar as the cause of permanent deafness found in chronic catarrhal otitis media.

(C) Chronic catarrhal otitis media.

The adhesions found in this stage are the result of previous attacks of effusion. Recurrent attacks of effusion during the adhesive stage if not treated cause an additional loss of hearing.

The most uncertain part of this clinical picture is the pathologic condition which causes the obstruction of the eustachian tube. Most textbooks and articles on this subject merely say that the tube is obstructed by swelling or hypertrophy of the adenoid or tubal mucous membrane, the latter either by inflammatory congestion or by hypertrophy of its lymphoid components. Also the inflammatory reaction accompanying an acute respiratory infection or a sinusitis is frequently given credit for the tubal obstruction.

The picture is further clouded by such statements as those quoted from Politzer,[7] in his chapter on diagnosis of strictures of the tube.

(1) It is important, however, to remember that occasionally a marked stricture causes no change in the curvature of the membrana tympani.

(2) As a rule, strictures of the tube are accompanied by a high degree of deafness and severe subjective noises. It must, however, be mentioned that there are exceptions to this rule, and that not

infrequently the latter may be entirely absent in cases of marked constriction.

(3) In most middle ear catarrhs unaccompanied by narrowing of the tube, as well as when the eustachian tube is in a normal state, one observes a freer entrance of air into the middle ear after bougieing.

This statement would lead one to believe that it is possible to have a middle ear catarrh in an individual with a normal eustachian tube.

(4) A feeling of fullness and pressure in the ear is rarely met with in true stricture; these symptoms are more often apparent when there is a slight swelling at the pharyngeal orifice of the tube.

This latter statement is in opposition to such cases as have been described as belonging to type 2, forming a clinical entity in which there is no disease present in the nose, sinuses or nasopharynx. The pharyngeal orifice of the tube appears entirely normal but the patients present themselves complaining of a sense of fullness in the ear, deafness, and usually tinnitus. Examination reveals a constriction of the lumen of the tube usually near the isthmus and an effusion of fluid into the tympanic cavity.

Quoting Guild, [12] et al:

In spite of the overgrowth of the tubal orifice with lymphoid tissue and a marked retraction of the tympanic membrane, the hearing may be excellent.

These statements taken with the uncertainty of our knowledge of the pathology responsible for obstruction of the eustachian tube, seem to make it advisable to consider some of the structures in the vicinity of the tube which might conceivably by their pathologic physiology produce pressure on, or displacement of, the tube and constriction of its lumen, or produce lymphatic edema by blocking the normal lymph flow from the lymphatic vessels of the tube.

There are two anatomical variables in this region which by their very inconsistency may lead to the various clinical pictures encountered in instances of identical etiology. These are the presence and location of the lymph nodes and the number and distribution of the veins of the pterygoid plexus which drain the middle ear and subjacent structures. In some individuals the retropharyngeal lymph nodes may be so situated as to produce a closure of the tube when swollen, while in others they may only interfere with the venous flow and produce passive congestion, or they may do both. The retropharyngeal lymph nodes receive their afferent channels from the mucosa lining the nasal cavities, the sinuses, the nasopharynx, the pharyngeal adenoid and the eustachian tube.

Infection in any one of these areas may produce an enlargement of the retropharyngeal lymph nodes with a resulting effect on the eustachian tube or other structures in the vicinity such as the accessory, vagus, hypoglossal and deep petrosal nerves.

Study of pathology of the lymphatic system reveals that there is a marked increase in the

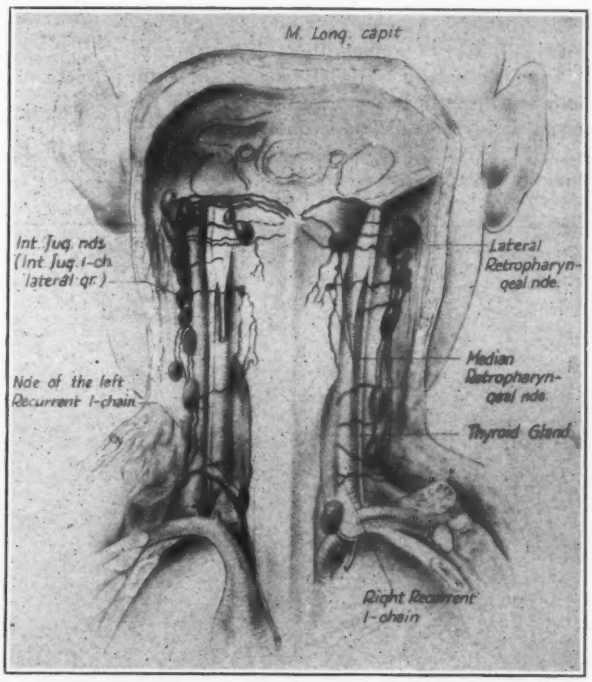
M. Long. capit
Int. Jug. nds. (Int. Jug. l-ch. lateral gr.)
Lateral Retropharyngeal nde.
Median Retropharyngeal nde.
Nde of the left Recurrent l-chain
Thyroid Gland
Right Recurrent l-chain

Fig. 2

Grouping of retropharyngeal glands. The retropharyngeal lymph nodes are divided into medial and lateral groups. These nodes drain the pretubal lymphatic plexus which in turn receives lymph from all the structures developed from the first pouch, namely: the nasal septum, sinuses, adenoid, nasopharynx, eustachian tube, and tympanum. In childhood they number from five to ten. In adults the medial group atrophies, frequently leaving only one or two lateral glands. This atrophy has occurred while the sinuses have been developing, thus producing an increased area for infection to be drained by a semi-atrophic lymphatic system.

(Schematic drawing from Anatomy of the Human Lymphatic System. Courtesy M. J. Tobias).

number and size of the lymph nodes which drain a tuberculous or cancerous area. The same condition exists in the nodes draining an infected area, but this increase is usually limited to the primary echelon of nodes into which the infected area drains. A pertinent question in this connection is, do the lymphoid structures found in the mucous membrane of the eustachian tube receive afferent lymph vessels from the pretubal lymphatic plexus which collects the lymph from the sinuses and nasopharynx and in this manner become enlarged, or have they, like the larger lymphoid structures of the pharynx, only efferent lymph vessels which drain into the retropharyngeal lymph nodes? In the former case the lymphoid elements in the tube would increase in size and number as they drained the nasopharynx and sinuses, while in the latter case they would not enlarge because of infection in the sinuses or nasopharynx, but only from primary infection.

M. J. Tobias[3] explains the obstruction of the eustachian tube by dilatation of the lymphatic vessels, which are very numerous in the mucosa lining the tube, as follows:

Insofar as is known, the lymphoid structures of the eustachian tubes do not receive lymph vessels from the pretubal lymphatic plexus, but on the contrary, the lymph stream appears to flow from the eustachian tubes to the plexus. If the above facts are now added to the description of the lymphatic drainage of the nasopharynx and eustachian tubes as described in our text,[4] it would appear that a given infection may be transmitted from one area to another either by direct extension via the capillaries, or via the lymphatic trunks, or by diversion of the lymph stream because of perilymphatic swelling, and lastly by retrograde invasion. To explain retrograde invasion, one will have to remember that eventually the lymph capillaries of the nasopharynx, for instance, will empty into larger lymph vessels. In this manner, the pretubal lymphatic plexus is formed and thus contains the lymph which has been collected from the adjacent sinuses, from the pharyngeal tonsil, and eustachian tubes. These then break up into lymph trunks which run respectively to the lateral retropharyngeal nodes and to the various lymph nodes of the internal jugular chain. If some of these lymph nodes are attacked by infection or inflammation, the lymph node will swell and act as an obstacle and arrest the normal lymph circulation. The lymphatic trunks above this obstacle dilate, its valves become incompetent, and a retrograde lymph circulation is established. In this manner, infectious material may disseminate retrogradely and be spread along the roots or origin of these lymphatic trunks.

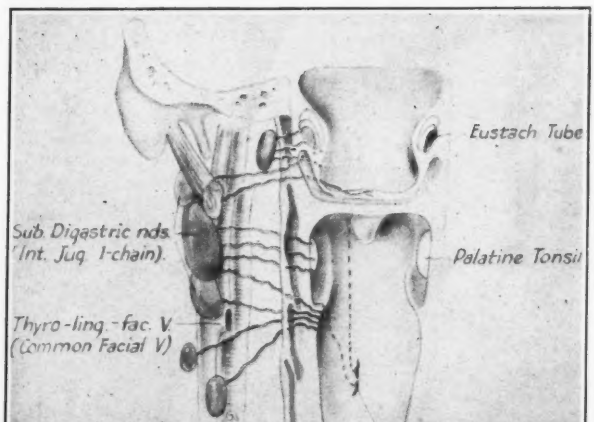

Fig. 3

The eustachian tube drains through the pretubal plexus into the lateral retropharyngeal glands. The region below the pharyngeal recess, the tonsil, and so forth, develops from the second visceral pouch and is drained by the subdigastric nodes. This explains the absence of symptoms of stenosis of the eustachian tube due to lymphatic congestion and edema during infection of the tonsil.

(Schematic drawing from Anatomy of the Human Lymphatic System. Courtesy M. J. Tobias).

TYPE II EFFUSION AS A CLINICAL ENTITY

(1) *Etiology.*—Patients with this condition in its early stages are not encountered very often in charity clinics where relief is rarely sought for a mild syndrome.

The patients are about equally divided as to sex, but age is a very important contributing factor. The youngest patient I have seen with this disease was 36 years, the oldest 62 years. It may be that the incidence is increasing along with the other diseases such as heart affections and carcinoma, which are more common because of the greater number of people now found in the older age groups.

A blood study was carried out on quite a number of these patients. It included a complete blood count and blood chemical analysis. The only abnormal finding present in all cases was a high blood cholesterol. This was commensurate with the low basal metabolic rate which each presented. However, administration of thyroid extract has had very little effect upon the course of this disease.

Chronic infection in the adenoid with resulting enlargement of the

retropharyngeal lymph nodes is a frequent cause of this condition. This infection frequently cannot be proved except by cytologic examination of smears from the surface of the adenoid and extensive culturing of bacteria from this region. In others surgical removal of the adenoid is necessary as a therapeutic test.

(2) *Symptoms.*—A sense of fullness, deafness, tinnitus and in some individuals autophony are the only symptoms presented by most of these patients.

(3) *Pathology.*—These are factors which must be taken into consideration in any case of otitis media with effusion: (1) increase in the blood supply to the tympanum which may be caused by infection in the tympanic cavity or infection in a neighboring structure. (2) Obstruction to the eustachian tube which may be caused by inflammatory thickening of the mucosa of the nasopharynx, orifice or lumen of the tube. (3) Mechanical blocking of the pharyngeal orifice of the tube by a nasopharyngeal tumor. (4) Pressure on, or displacement of, the lumen of the tube by some structure, such as an enlarged lymph node in the region which the tube traverses. (5) Venous stasis or passive congestion in the tympanum caused by pressure on the veins of the pterygoid plexus which drain the middle ear, thereby causing a transudation of fluid through the vessel walls in the area of stasis. Theoretically this should require very little pressure when one considers that the venous pressure here falls to or below atmospheric pressure with each inspiration. (6) Dilatation of the capillary network of lymph vessels in the tubal mucosa due to an enlarged lymph node which blocks the lymph flow. (7) Pressure on the eustachian tube by the condyle of the mandible.

The otitis media with effusion resulting from the first three factors just mentioned is a coexisting symptom of well defined disease in the nose or nasopharynx and will usually disappear with the subsidence of the inciting cause. However, effusion into the middle ear due to external pressure on the tube or veins, or both, such as might be produced by a lymph node without coexisting disease, would be governed by mechanical factors without an inflammatory process in the ear or tubal mucosa.

This differentiation between the two groups of cases which we have been considering under type 1 and type 2, is borne out by the characteristics of the fluid obtained from the tympanum by aspiration with a blunt needle and syringe through the anesthetized drum. The fluid from those cases included in type 1 is an exudate and that from type 2 is a transudate, as will be seen from the accompanying table:

	Albumin	Globulin	Total Protein
Type 1	6.46	3.49	9.95
Type 2	0.96	0.63	1.59

Infection with resulting purulent otitis media and mastoiditis may occur in this fluid at any time during the course of the disease due to intercurrent respiratory infection or to the treatment administered. When this occurs it runs the usual course of an acute purulent otitis media and often results in a cure of the subacute symptoms of effusion. However, I have had two patients each of whom have had three, one patient who has had two, and one patient who has had one intercurrent attack of acute purulent otitis media. In all these instances after each attack subsided the effusion into the middle ear re-

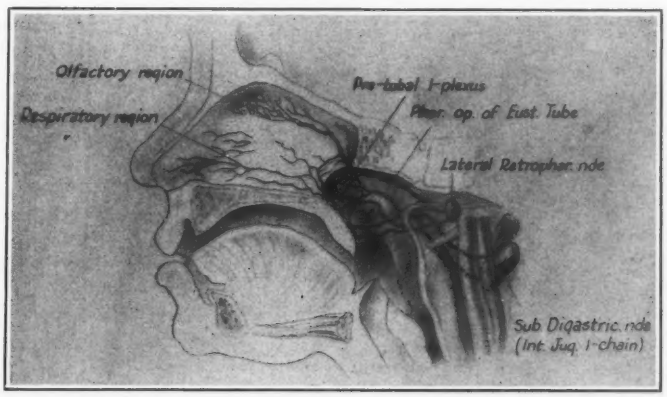

Fig. 4

Lymph vessels of nasal septum. The pretubal plexus of lymph vessels drain the nasal septum into the lateral retropharyngeal nodes (primary echelon) and jugular chain (secondary echelon).

(Schematic drawing from Anatomy of the Human Lymphatic System. Courtesy M. J. Tobias).

curred, thus indicating that the original pathologic cause of the condition was still active.

The nasal cavities, nasopharynx, eustachian tube and tympanum develop from the same embryologic structure, that is, the first visceral pouch, and consequently carry the same lymphatic system of drainage with them, with the result that the primary echelon of their lymphatic system lies in the medial and lateral chains of the retropharyngeal lymph nodes. Their secondary echelon is found in the deep cervical jugular chain of nodes which also drain the jugulodigastric gland which forms the primary echelon of the tonsil region. Palpable and visible swelling of this latter node so frequently accompanies purulent infection of the tonsil that it would be very unlikely for the retropharyngeal lymph nodes not to share the same fate under the stress of similar infection in the region which they drain.

Malignancies of the nasopharynx seem very quickly to involve the nodes in the deep cervical and jugulodigastric area which are the secondary echelon of lymph nodes for this region. This means that the retropharyngeal nodes comprising the primary echelon of this area are involved much earlier. This early enlargement of the retropharyngeal lymph nodes due to malignancies in this region frequently causes effusion of fluid into the tympanum and mastoid cells which may be the first and only abnormal condition of which the patient complains when he consults the otologist.

(4) *Diagnosis.*—A painless non-inflammatory effusion of sterile serous fluid into the tympanum and mastoid cells, retraction of the otherwise normal-looking drum, slight conduction deafness both objective and subjective; tinnitus and slight obstruction to the eustachian tube in the absence of any pathologic condition in the nose, sinuses or nasopharynx, are characteristic of the early stage of this disease. During this stage the tube inflates and may be bougied very easily. Also paracentesis of the drum followed by inflation relieves the sense of fullness in the ear and restores the hearing. Incisions in the drum in these patients usually close within 24 to 48 hours with a return of the fluid. In many of these patients it is very difficult to see the fluid in the tympanum for it frequently flows back into the mastoid cells, particularly while in the dorsally recumbent position when the individual will say that he hears much better. Frequently the presence of fluid in the tympanum cannot be demonstrated except by myringotomy followed by inflation. Kerrison[5] observes:

> A limited amount of mucoserous fluid collects in the lower part of the tympanic cavity. Usually it is not sufficient in amount to influence the position of the drum membrane, and may be quite indeterminable by inspection.

As this disease progresses a characteristic funnel-shaped depression occurs at the umbo, the secretion contains more mucus, at times becoming thick enough to form a cast, large mononuclear leukocytes and epithelial cells appear in the secretion, the tinnitus and deafness increase and are not relieved by myringotomy and inflation, and later the adhesive processes occur which prevent free movement of the drum and ossicles.

Infection of the sinuses and nasopharynx is so often associated with mild or severe symptoms of a sense of fullness in the ears, deafness and neuralgic pains over the side of the face and head that we ordinarily pay slight attention to these symptoms, knowing they will clear up when the acute process subsides. But frequently the acute process subsides and days or weeks later the patient comes to the otologist complaining of deafness and upon ex-

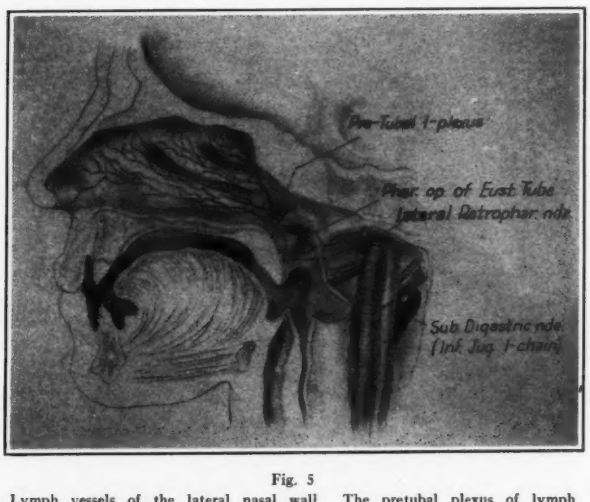

Fig. 5

Lymph vessels of the lateral nasal wall. The pretubal plexus of lymph vessels drain the lateral nasal wall and the sinuses into the lateral retropharyngeal nodes.

(Schematic drawing from Anatomy of the Human Lymphatic System. Courtesy M. J. Tobias).

amination, he finds an infected sinus, usually maxillary or sphenoid, or an infected adenoid which has failed to recover. There may also be a normal-looking pharyngeal orifice of the tube with an obstruction at or near its isthmus which may or may not be associated with an effusion into the tympanic cavity. There are a number of variations of this clinical picture and one logical explanation: a closure of the lumen of the tube, by lymphatic edema of its mucosa or by pressure from an enlarged lymph node which did not subside with the subsidence of the acute symptoms of the sinus or nasopharyngeal infection.

TREATMENT

These patients grouped under type 1, those with coexisting pathology in the nose, sinuses or nasopharynx, in whom the effusion is really a symptom, usually lose their effusion and the ear returns to normal when the inciting disease is corrected. If they do not, then they are to be treated by the same procedures which are used in treating these cases which are grouped in type 2:

(1) *Myringotomy.*—This operation is performed as often as is necessary to keep the adhesive changes due to organization of the fluid from occurring in the middle ear. It is usual to precede and follow opening of the drum by inflation to expel the fluid. Inflation and the rarefying otoscope also aid in determining whether the characteristic concentric depression which forms at the umbo is due to simple retraction of the drum, adhesion of the drum to the promontory or contraction of the tensor tympani muscle.

(2) Suction applied to the tympanum through the opening in the drum is at times necessary to remove very tenacious and thick mucoid secretion which is sometimes present when the effusion has been in place for a considerable period of time without treatment.

This tenacious secretion may go unnoticed. If some thin fluid is expelled by inflation after myringotomy the operator may think he has removed it all. The presence of this thick tenacious secretion should be suspected when the patient fails to experience the relief customarily incident to evacuation of the fluid and the audiogram fails to show the expected improvement in hearing.

(3) Aspiration of the tympanic cavity with a blunt needle on a syringe of small caliber has been used frequently with results commensurate with myringotomy in individuals with thin serous effusion. This method has the advantage of not injuring the drum as much as incision and is to be preferred where the procedure is to be often repeated.

(4) A gauze wick saturated with sterile glycerine placed in the external auditory canal against the opening in the drum will aid in keeping the perforation open and the hydroscopic action of the glycerine will cause much more of the fluid to drain from the perforation. This pro-

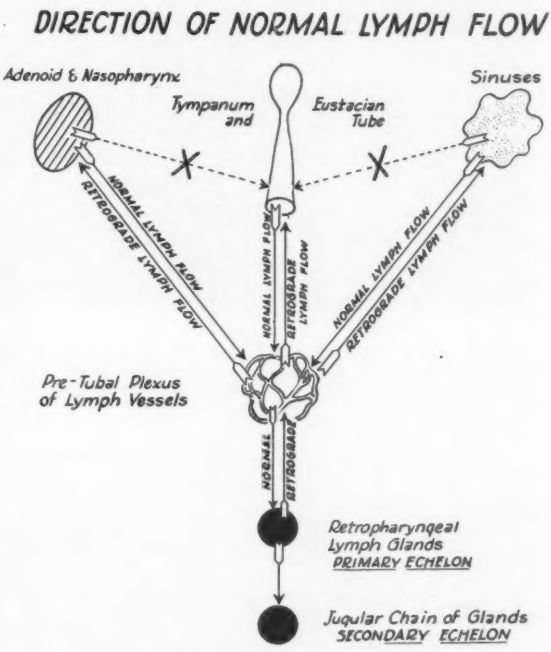

Fig. 6

The mechanism of lymphangitis of the retropharyngeal lymphatic system. The normal lymph flow from the sinuses, nasal septum, adenoid, nasopharynx, eustachian tube and tympanum is into the pretubal plexus and not directly from one of these areas into the lymphoid tissues of the eustachian tube. Infection in the sinuses or adenoid imposed on a semi-atrophic lymphatic system causes a swelling of the nodes and a blocking of the lymph flow. This results in a retrograde flow through the freely anastomosing vessels of the plexus into the uninfected areas drained by the plexus. The lymph edema of the mucosa of the eustachian tube produced in this manner causes a stenosis with resulting effusion into the tympanic cavity which overflows into the mastoid cells from which it is not absorbed because of the sparse blood supply of its mucosa. Organization of this fluid leads to adhesive processes in the tympanum, terminating in chronic catarrhal otitis media with its accompanying deafness.

cedure was advised by Dr. John H. Foster and has proven to be a very valuable adjunct.

(5) Bouginage of the eustachian tube is indispensable in treating certain types of this disease. It is contraindicated and may do considerable damage to the tube in individuals who have an obstruction of the tube due to the mechanical pressure of an enlarged adenoid or to an inflammatory process involving the nose, sinuses or nasopharynx which may be producing inflammatory swelling of the pharyngeal orifice of the tube or obstruction of the cartilagenous portion of the tube along its lumen or at its isthmus by pressure of a swollen lymph gland.

Those patients with tympanic effusion who show no coexisting disease usually inflate easily. However, after bouginage the air seems to go through even more freely. This would lead one to believe that the obstruction is not in the lumen of the tube, but is due to pressure on its outside. Obstructions of the tube due to narrowing of its lumen from within usually have to be dilated with small bougies first, then with larger. Obstructions due to pressure of lymph nodes outside of the tube will allow air to pass through the tube and will allow the passing of a normal-sized bougie. However, if this pressure is continued for a long period of time it may affect the lining membrane of the tube, causing stricture formation either by displacement of the axis of the tube or by simple pressure with the resulting circulatory difficulties.

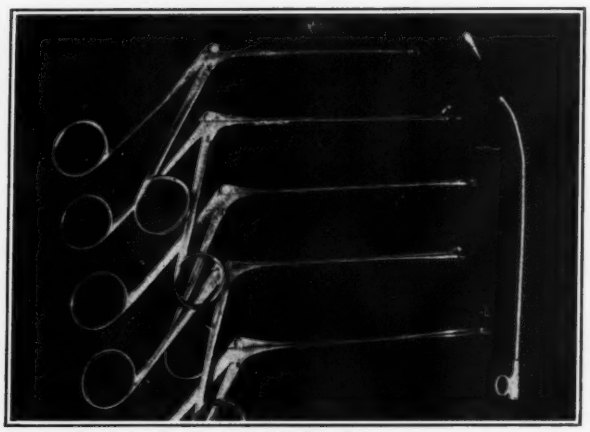

Fig. 7

Instruments for removal through the nose of hypertrophied or infected lymphoid tissue from the nasopharynx. Instruments are guided by vision through the nasopharyngoscope in the opposite nostril. The conventional nasal punch is shown at the top for length. The eustachian catheter with swab shown at the right is used to take cultures from the adenoid and for the study of regional cytology.

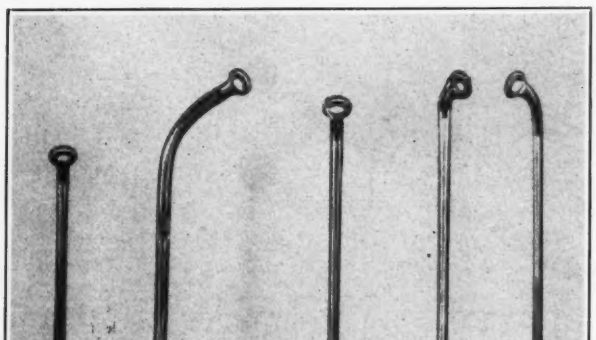

Fig. 8

View of tip of instruments in *Fig. 7*. The conventional nasal punch is shown at the left for comparison of length.

(6) The susceptibility of hyperplastic lymphoid tissue to irradiation with radium and x-ray has made possible a widely accepted therapeutic procedure of considerable clinical importance. Rathbone,[8] Crowe,[9] and Moore,[2] and others, have recently reported encouraging results of its use in deafness due to lymphoid hyperplasia in the nasopharynx and in the eustachian tube. J. J. Richardson, according to Ballenger,[6] has used roentgen ray in the treatment of deafness and reports some good results, regardless of the initial cause of the deafness.

This brings up the question of whether the good results reported by a number of observers following irradiation of the lymphoid tissue of the nasopharynx and eustachian tube have been due in part to the simultaneous effect of the irradiation on the retropharyngeal lymph nodes.

After the coexisting pathologic condition has been corrected, the cases grouped under type 1 usually return to normal very promptly, but if they do not, irradiation definitely accelerates improvement by

reducing the enlarged retropharyngeal lymph nodes.

Cases grouped under type 2 also return to normal much more quickly when irradiation is used as an adjunct in the treatment. In several of my patients who have had no demonstrable coexisting disease, the eustachian tubes have become patent again only after irradiation. This form of treatment should always be tried before resorting to mastoid surgery and it should not be delayed until the eustachian tube has developed a fibrous stricture.

(7) Impending permanent partial loss of hearing is an indication for a simple mastoidectomy in acute or subacute purulent otitis media and mastoiditis. When the more conservative measures fail, simple mastoidectomy is indicated in catarrhal otitis media and mastoiditis with effusion. Cody[1] was the first to report the rationale of mastoidectomy as a therapeutic procedure in this disease, and he has experienced exceedingly satisfactory results which have been substantiated by a number of observers over the country.

Progressive loss of hearing, persistent accumulation of fluid, and tinnitus, have been given by Cody as indications for operation. To these indications may be added the cytological and chemical examination of the fluid aspirated from the tympanic cavity.

After fluid has been present in the middle ear for a period of time, large mononuculear leukocytes and epithelial cells make their appearance. These cells are indicative of formation of adhesive processes and give an indication as to the progress of the disease. They are not present in the fluid found as a result of recent effusion, either during the primary attacks or during recent recurrent attacks in an ear with old adhesive processes.

Observation has been that cases which may be grouped under type 2 as a clinical entity always have an extensively pneumatized mastoid process which was visualized either by x-ray or at operation. The pneumatization has frequently extended well into the temporal bone and has provided a large reservoir of fluid to flow into the middle ear to keep up the irritation of the mucous membrane and cause adhesive processes. In the absence of absorption of this fluid it would seem advisable to obliterate the reservoir by simple mastoidectomy, before the adhesive processes occur. Also these cases have all been unilateral and many of them have had recurrent attacks with resulting loss of hearing with each attack which would encourage one to resort to more radical measures. Two of my patients gave a history of having lost the hearing in the opposite ear eight and eleven years previously from a condition which they described as identical with the attack in the good ear for which they sought treatment. Examination of the previously deafened ear revealed old adhesive processes in the middle ear and their audiograms revealed a deafness of 62 and 71 per cent for speech. Otologists now would censor a man who refrained from a simple mastoidectomy and allowed this termination to purulent infection. The same line of reasoning applies to catarrhal otitis media and mastoiditis with effusion. As Politzer[7] says:

> In unilateral deafness of a high degree the predisposition of the normal ear to become diseased is very much increased.

SUMMARY

(1) A classification of catarrhal otitis media and mastoiditis with effusion has been offered which regiments these cases clinically according to the presence or absence of coexisting disease.

(2) Some of the physical and chemical characteristics of the effused fluid in the ear in this disease have been noted as follows: the effusion in type 1 is an exudate, it has a high protein content (9.95) with many polymorphonuclear leukocytes. The effusion in type 2 is a transudate. There are few polymorphonuclear leukocytes, there is a low protein content (1.95) and when the fluid has been present in the tympanum long enough to cause the beginning of the chronic catarrhal stage with its adhesions, large mononuclear leukocytes and epithelial cells make their appearance.

(3) The importance of irradiation in the treatment of this disease has been stressed.

(4) The tendency of this disease to recur and subside spontaneously, the absence of organisms and purulent changes in the effused fluid and its response to proper treatment lead one to believe that the true etiology of this condition is a mechanical one. The basis for such a mechanical theory is as follows: an infection in the sinuses or nasopharynx is followed by inflammation and enlargement of the lateral retropharyngeal lymph nodes and adjacent perinodal tissues. This may result on the one hand in either a mechanical blockage of the tube by direct pressure or displacement of its axis. Or, on the other hand, as suggested by Tobias:[3]

> The lymph node will swell and act as an obstacle and arrest the normal lymph circulation. The lymphatic trunks above this obstacle dilate, the valves become incompetent, and a retrograde lymph circulation is established.

In this manner, lymph channels in the tubal

mucosa will dilate with resulting lymph edema and produce obstruction of the eustachian tube. This mucosal lymph edema and resulting circulatory change, if allowed to persist, will eventuate in chronic fibrous stricture of the tubal lumen.

No attempt has been made in this paper to report numbers of cases or percentages of hearing defects. Studies are continuing at the University of Texas on this subject and will be reported in a future communication.

A great amount of aid and cooperation in the study of this disease is gratefully acknowledged from Dr. Donald Duncan, Professor of Anatomy; Dr. W. B. Sharp, Professor of Bacteriology; Dr. George Dechard, Associate Professor of Medicine; Dr. Paul Brindley, Professor of Pathology, and their assistants in the University of Texas School of Medicine. I also wish to thank Dr. Violet Kieller for her constructive consultation, and Mr. R. A. Sage and Mr. George A. Newman, of the Department of Medical Illustrations, for their excellent technical work.

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DISCUSSION (*Abstract*)

Dr. J. W. Jervey, Greenville, S. C.—Dr. Robison has arrived at the same conclusion that I reached nineteen years ago in a paper published in the *Journal of the American Medical Association* in 1922. This article, the first that was ever written on the subject, was delivered by me here in St. Louis. I described the nature of what I chose to call mastoiditis hyperplastica serosa.

Norval Pierce, one of the men who discussed my paper, said undoubtedly it was a congenital condition. I do not think so.

Dr. John J. Shea, Memphis, Tenn.—Since Dr. Cody's first presentation of this subject before the Southern Section of the Triological, we have been on the lookout for a typical case, and this summer I encountered one in an airplane manufacturer. He flew when he had an acute cold, and when seen, presented the typical ear findings of a flat drum, through which was visible a fluid level. Aspiration obtained a clear straw-colored fluid of the transudate type. In as much as these fluids are sterile for bacteria, it is possible that a virus may be the cause of the pathology.

I would like for the doctor in closing to answer when he thinks that one of these cases should have surgery.

Dr. Claude C. Cody, Houston, Tex.—As Dr. Robison says, we have a number of synonyms for the same pathologic condition. It therefore may be assumed that there is considerable confusion in our ideas about it: as to the etiology, pathology and treatment.

Up to four or five years ago, I looked on acute catarrhal otitis media as a minor complaint, whereas, as a matter of fact, catarrhal otitis media yields first place to acute suppurative otitis media only if the latter is septic. It is probable that more damage is done to the hearing by the acute catarrhal conditions than by the acute suppurative conditions, because the pain and septic symptoms of the latter put such pressure on the attending otologist that he must correct it.

In the literature of the last sixteen years, since 1925, I have found no reference to this condition.

I am very glad to learn this morning for the first time that Dr. Jervey has described the same conditions, that he has operated and found largely the same pathology that I did and published some nineteen years later, but he concealed his findings under the very formidable title of mastoiditis hyperplastica serosa.

I believe there can be no disagreement as to the tremendous importance of acute catarrhal otitis media and acute catarrhal mastoiditis, and there is such a thing as acute catarrhal mastoiditis which should be treated either by irradiation or by simple mastoidectomy.

Dr. Hugh Miller, Kansas City, Mo.—The essayist speaks of subacute catarrhal otitis media and mastoiditis with effusion as sequelae of an inflammatory condition of the upper respiratory tract. He also says that this is not an infected condition, but forms in the mastoid without the pathologist's finding organisms or other evidence of infection. Therefore it is not inflammatory.

In various conditions in the upper respiratory tract we are unable to locate the organism, yet are sure from the history and clinical picture that there must be infection. In chronic catarrhal conditions we do not attribute all to this organism or that organism, but believe there may be some organism which we cannot determine because of its filtrability. I am inclined to think that there is an organism there that we have not yet found.

The author discusses the condition surrounding the tube as causing the backing up of fluids in the middle ear. I think this hypertrophy of the tissues surrounding the tubes is associated with the lymph nodes. These lymph nodes drain in the tissues and have produced thickening of the tissues.

Did you ever see a lymph node of the neck or of the groin without some exudate around it or thickening of the tissue? The subject under consideration is of a chronic condition and we have considerable exudate or hypertrophy of the tissue that reduces the caliber of the tube as well as by the lymph nodes.

The author says that we have in these cases very large mastoid cells. This I believe to be true. Now, a

fact of importance which he did not sufficiently emphasize is that the larger the mucous area the greater the mucus. There is a prolongation of the mucous membrane through the antrum and into these mastoid cells making a very large area for exudation of the mucus, and its only way of escape is through the middle ear and down the eustachian tube. The greater the mucous membrane the greater is the amount of mucus, while on the other hand as a result of this, an inflammatory condition, hypertrophy surrounding the tube, there is not correspondingly enlarged passage for the mucus to escape. We have less opportunity for escape of the mucus through the tube and there sets up a vicious cycle.

The treatment of this must depend upon opening the tube and getting drainage here or getting rid of the fountain of the flow of the fluid. Of course, naturally we must make an effort first to get rid of this secretion through the natural passage by making the tube more patulous for drainage. If that is not accomplished, we have to get rid of the fountain above by mastoidectomy. I have treated these hypertrophies around the tube by 10 per cent silver, also by x-ray.

I want to discuss here for a moment incision and drainage through the tympanum. We are told in literature to make one incision, and the author says to make a small incision. For years I have made an incision in the lower inferior area of the tympanum and also a counter incision above. You have fifteen pounds of air pressure into the external auditory canal; this presses and interferes with the flow of the fluid especially if it is viscid and it will not drain well. Did you ever turn a jug full of water upside down and see how poorly it flows with the stopper out? You have the same thing here. The tube is closed. You have a solid bony chamber, and no way of applying pressure unless you get a counter puncture that will force the fluid out through the lower opening.

Dr. Robison (closing).—Dr. Jervey's statement that he described a similar condition many years ago under a different title is appreciated. I quoted a number of synonyms for the title to this paper. These were taken from Politzer's *Diseases of the Ear*. My impression of Dr. Jervey's description of the condition which he reported is that he described this disease after infection has occurred in the tympanic and mastoid effusion.

Dr. Miller brought attention to the changes which occurred in the tissues around the infected lymph nodes. I mentioned this periglandular inflammation as a possible etiologic factor in production of stenosis of the tube by pressure on its exterior.

Dr. Shea asked about indications for operation upon these patients. Lack of time prevents going into this in detail. I refer you to Dr. Cody's article on "Acute Catarrhal Mastoiditis" for this. In addition a careful chemical and cytological study of the effused fluid is a guide.

We are indebted to Dr. Cody for his introduction of the simple mastoid operation into the treatment of this condition.

I have presented this disease to you as comprising a clinical entity, characterized by a lymphangitis of the retropharyngeal lymphatic system terminating after one or more attacks in chronic catarrhal otitis media with its accompanying impairment in hearing.

THE DIAGNOSIS AND A NEW TREATMENT OF TRAUMATIC RUPTURE OF THE POSTERIOR URETHRA*

By C. J. REYNOLDS, M.D.
Bluefield, West Virginia

In this treatise on injuries of the posterior urethra, for practical purposes that portion of the urethra which lies within and behind the triangular ligament will be considered. This portion of the urethra is inaccessible to direct injury as it is well protected by the pelvic girdle and is rarely ruptured except by injury to the pelvic bones. A rare exception is a penetrating wound. Regardless of the exact location of the posterior urethral injuries, the sequence is similar; that is, urinary obstruction, partial or complete, followed by extravasation of blood and urine into the prevesical tissues.

Time will not permit me to discuss the various methods that have been used for the purpose of restoring the posterior urethra to its normal function following injury. These methods have been more or less successful. To treat this accident successfully three things must be done, preferably without delay. First, re-establish adequate urinary flow; second, re-establish normal alignment and contour of the injured urethra; third, prevent undue elongation of the posterior urethra by promptly removing extravasated blood and

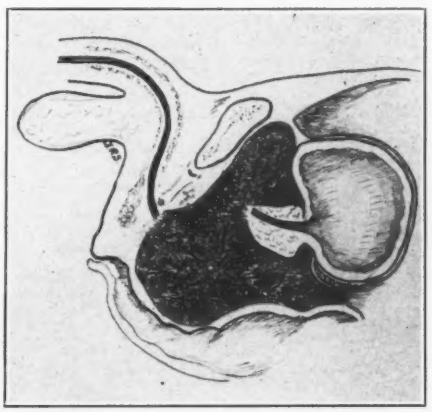

Fig. 1
Complete division of urethra, prevesical hemorrhage, displacing bladder upward.

*Read in Section on Urology, Southern Medical Association, Thirty-Fifth Annual Meeting, St. Louis, Missouri, November 10-13, 1941.

urine and by adequate drainage. This also diminishes the incidence of infection.

A perineal urethrotomy, which is one of the recognized means of draining the bladder, is not altogether satisfactory because the pelvic bones are broken and in placing the patient in the lithotomy position this will exaggerate the fracture and retract the severed ends of the urethra. This makes the repair of the urethra more difficult and distorts the normal alignment of the canal.

A suprapubic cystotomy alone is not sufficient because the prevesical injury predisposes to infection. When urethral repair is delayed, scar tissue formation between the torn ends of the urethra promotes a tendency to distortion, sinus and stricture formation. Also the process of establishing a normal continuity of the urethra becomes more difficult. We are fortunate if we see the patient early.

It is with the hope of aiding in the care of these unfortunates and of eradicating some of the pitfalls that I am presenting a new method of treatment, along with a resume of my experience in the handling of 29 such cases during the years 1929 to 1941 inclusive. I have chalked up many errors in my efforts, but believe that I have developed a simplified plan of using the Foley indwelling catheter, which certainly in my hands has proven very satisfactory. Its use restores the normal position and continuity of the prostatic urethra. The catheter also acts as a urethral splint, affords bladder drainage, and helps control hemorrhage. This method will be described later. Ormand and Cothran* in 1934 reported a case with ruptured posterior urethra in which they used successfully the Pilcher bag to obtain similar results.

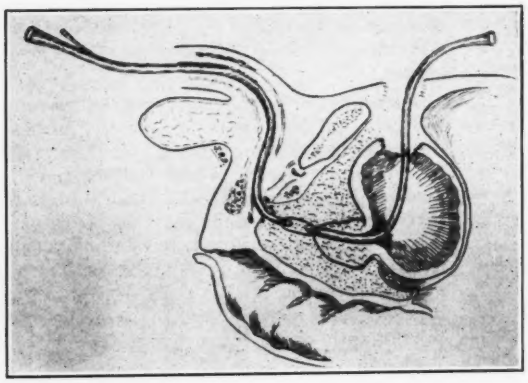

Fig. 2

Foley catheter in urethra. Plain catheter passed through cystotomy opening and out the prostatic urethra. Tips of catheters joined by suture, making it simple to draw the Foley catheter into the bladder.

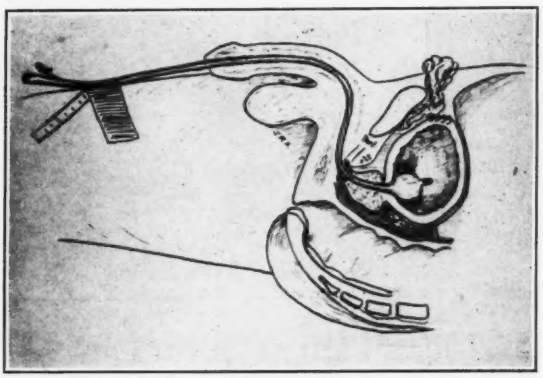

Fig. 3

Balloon of Foley catheter distended. Traction on catheter pulls bladder into position and approximates severed ends of urethra. Traction maintained by adhesive on leg. Drains placed in prevesical space.

Diagnosis.—There is usually the history of the accident which involves the fracture of the pelvic bones. This may be verified by the x-ray. The pubic bones are often broken and in being pushed mesially sever the attachment of the prostatic urethra from the membranous portion by direct scissors-like action, or the rupture may be only partial. There is usually some degree of shock, which is often severe. Subcutaneous hemorrhage over the pubic region with tenderness on pressure is frequent. Blood will be noticed within the urethral meatus. The patient is usually unable to void but if he can be tempted to try he suddenly experiences a severe pain in the deep pelvis which is the result of voiding within the tissues. Little or no urine may escape from the urethra, although sometimes bloody urine does appear. Pain continues after the effort. Attempt to catheterize the patient will be unsuccessful if the rupture is complete but if it is incomplete usually the catheter slips into the bladder and the first few drops of urine are bloody, followed by clear urine. Sometimes a fullness may be felt anterior to the rectum

*J.A.M.A., **102**:2180-81, 1934.

on digital examination. This is due to a hematoma at the site of injury. Rarely is there a hematoma in the perineum. If the membranous urethra is injured, some extravasation may be noted in the scrotal perineal area. If the bladder is distended, a fullness may be felt in the lower abdomen, dullness is elicited, and sometimes muscular rigidity which suggests an intra-abdominal rupture.

Treatment, using the Foley Catheter.—This differs in incomplete and complete rupture. If the patient is in shock, this should be attended to first. Using surgical precautions, an attempt is made to catheterize the urethra, using a No. 18 Foley catheter. Sometimes after slight manipulation the catheter slips into the bladder without difficulty and one knows the rupture is incomplete. If successful, the end of the catheter is placed well within the bladder and the balloon is distended to about 5 c. c. This is left in position and acts as an indwelling catheter. The catheter is connected with rubber tubing to a bottle at the bedside. If there is definite evidence of a hematoma in the perineum, this should be drained. It is well to give these patients one of the sulfonomide drugs for four or five days, certainly if there is any elevation of temperature. Usually convalescence is uneventful. The spilling of urine into the tissues, which usually follows this accident, is not harmful, but becomes so when infected. It is most important to use an indwelling catheter over a period of three weeks, changing it at weekly intervals. Usually complete epithelization and healing have taken place by this time and no ill results follow its removal. The patient may be able to void after one week if instructed to do so, but due to the fact that healing is not complete he should not be allowed this privilege. If the catheter is removed too early and the patient allowed to void, the act becomes more difficult or impossible. This is due to the fact that the urine, which has become infected, seeps through the unhealed rupture, producing a cellulitis. A fever develops and later suppuration which usually is manifest by swelling in the groins. This condition requires surgical drainage.

In the treatment of complete rupture of the urethra the technic is more difficult. If the catheter does not pass into the bladder but on the contrary buckles up in the macerated prevesical space, there is usually the escape of bloody material through the catheter, and it is a pretty good indication that the rupture is complete. Immediate surgery, in my opinion, should be done. Local anesthesia is sufficient. A suprapubic midline incision is made and if there is reason to believe that there is a possible rupture within the peritoneal cavity, this should be opened and explored. If no rupture is evident, the peritoneum is closed and a suprapubic cystotomy and exploration are done. Fragmented bone may be detected. Usually the urethra is completely divided and the bladder is recessed into the pelvic cavity. The prevesical space is macerated and filled with blood and urine. This debris should be removed with gentle sponging. It is not always easy to find the separated ends of the urethra. A No. 18 Foley catheter is passed into the penile urethra. The tip usually can be seen or felt readily at the site of the injury. If both ends of the torn urethra cannot be easily located, a catheter is passed within the cystotomy opening and through the prostatic urethra. Once this is accomplished a thread is passed through the eyes of both catheters and tied loosely. Then by traction the Foley catheter is drawn through the prostatic urethra into the bladder. The balloon of the Foley catheter is then distended with water and the suprapubic catheter guide is removed. Tension is placed on the indwelling catheter and by this means the base of the bladder is brought down to its normal position and the severed ends of the urethra are thus brought in direct contact and in perfect alignment. This position is maintained by attaching the catheter to the leg with adhesive, using slight retraction. Bleeding is controlled by thus obliterating the prevesical space and by proper drains. Urethral repair otherwise is unnecessary. It is unnecessary to use a suprapubic catheter for bladder drainage. The suprapubic incision is closed with interrupted sutures. If drainage through the urethral catheter is satisfactory, no attempt is made to irrigate the bladder as this is considered unnecessary. The indwelling catheter is removed, cleaned and replaced at the end of seven days, using only sufficient traction to keep the balloon snugly against the sphincter. This is also repeated on the fourteenth day and removed permanently on the twenty-first day. The suprapubic drains are usually removed on the third or fourth day. The catheter acts as a splint, and epithelization and healing of the urethra take place rapidly and there is a minimum tendency to stricture formation or distortion of the posterior urethra. Urethrograms, as well as function, have proven that results are all that could be desired. A No. 28 sound is passed after two weeks and again at the end of one and two month intervals. If there is any indication, further dilatation is

carried out at longer intervals. However, this is usually unnecessary.

Briefly summarizing the findings and results in the 29 cases treated; 23 injuries were caused by a severe blow, such as slate fall across the pelvis, 6 were caused by being rolled between the mine cars and the side of the wall. All had multiple fractures of the pelvis. All patients were within the earning age, and the time lapse between injury and admission to the hospital was not more than six hours. Complete severance of the posterior urethra was proven in 14 cases, 15 having incomplete lacerations. The various methods used are as follows: suprapubic cystotomy followed later by urethral sounds, 1; suprapubic cystotomy for immediate drainage followed later by perineal urethrotomy and repair, 3; suprapubic cystotomy and indwelling catheter, plain 2, with Foley catheter 4; perineal urethrotomy and indwelling catheter, plain 3; perineal urethrotomy followed later by sounds, 2; indwelling catheter, plain 7, with Foley catheter 5. No catheter was used in two cases which had only a slight evidence of rupture. The previously described technic, using the balloon retention catheter, was used in nine cases.

In this series there were four deaths, or 13.8 per cent. A brief analysis of the deaths discloses that two had complete and two incomplete ruptures of the posterior urethra. In one case of complete rupture, a suprapubic cystotomy with drainage was done. Death followed from pneumonia after 11 days. In the second case a suprapubic cystotomy and perineal drainage was done. The patient died of shock and sepsis at the end of 16 days. One patient had a partial rupture of the posterior urethra. A plain indwelling catheter was used which was removed at the end of five days. Difficulty in voiding was experienced, accompanied by fever, and the catheter was replaced three days later. Pelvic suppuration with abscess developed in the left groin. The patient died at the end of 26 days of sepsis. The fourth patient had an incomplete rupture of the prostatic urethra and died of pneumonia on the thirteenth day. He was treated with a plain indwelling catheter which was removed on the fourth day and later replaced.

I am satisfied that the two latter deaths reported are due largely to the fact that the catheter was removed too early and the patient was allowed to void, which was partially successful. However, the rent in the urethra had not healed and urine escaped into the peri-urethral and pelvic tissues and suppuration and sepsis followed. Had these patients been treated as previously outlined, the outcome might have been different.

Three patients treated by indwelling catheter developed an abscess in the groin, and fever, but recovered following the opening of the abscess, and in these three cases the complication resulted only after removing the catheter too soon.

Summary: In summarizing the results obtained, using the Foley catheter in the manner described, I have treated nine cases of ruptured urethra, four being complete and five incomplete. There have been no deaths and the only complication was in three cases of incomplete rupture, in which an abscess developed in the groin necessitating drainage. These I interpreted to be the result of removing the catheter too early.

I believe that this plan of treatment can be recommended on the basis of its simplicity, safety and tendency to a minimum stricture formation along with restoration of normal function.

Discussion follows paper of Dr. Turley, page 831.

TORSION OF THE TESTICLE AND ITS APPENDAGES*

By HUBERT K. TURLEY, M.D.
Memphis, Tennessee

Torsion of the testicle and its appendages is becoming generally recognized and operated upon as is shown by ever-increasing reports of these cases in the literature. However, upon inquiry at the record office of the various hospitals, I was surprised to find few cases that have been diagnosed and operated upon. Inquiry among physicians who practice pediatrics astonishes one at the large number who reply that they have never seen the condition. A great many cases of so-called epididymitis are treated conservatively by elevation, ice bags, and so on, and a consultation with a urologist is not obtained. I am of the opinion that a large number of cases are not rightfully diagnosed. This error results in the atrophic testicle observed later in life which is thought to be the consequence of orchitis complicating mumps or trauma. As most of these cases are seen in young individuals and first seen by those physicians practicing pedi-

*Read in Section on Urology, Southern Medical Association, Thirty-Fifth Annual Meeting, St. Louis, Missouri, November 10-13, 1941.

*From the Department of Urology, the College of Medicine, University of Tennessee.

atrics, a more definite campaign should be made by us to call their attention to this condition.

Torsion of the testicle or its appendages becomes a surgical emergency as soon as diagnosed. The preoperative symptoms and signs are identical. No attempt will be made to differentiate them in this paper. Occasional cases of torsion of the testicle are spontaneously reduced and a true diagnosis is not made. These are usually called epididymitis which have got well by conservative treatment.

The hydatid of Morgagni is a vestigial structure of the mullerian duct. It is usually pedunculated, which accounts for liability to torsion. Fortunately, this condition has not the serious consequences of torsion of the testicle if neglected. This condition was first reported by Colt[1] in 1922. Dix,[2] Randall[5] and Rolnick[6] and others reviewed the literature and added cases of their own until approximately seventy-six cases were reported.

According to these writers, torsion of the hydatid of Morgagni is seen in children. Testicular torsion is seen in young adults. However, torsion of the testicle may occur at any age and is usually a result of mal-development or mal-descent of the testicle. In the normal testicle a short and relatively broad gubernaculum fixes the testicle in the longitudinal diameter, while the vessel to the testicle passing posteriorly fixes it in a transverse diameter. Some writers claim torsion is more common in undescended testicles. However, I agree with O'Connor[3] that in undescended testicle surgical interference is more frequently advocated than in the normally placed testicle. Therefore, the most frequently correct diagnosis and treatment are carried out on these cases.

According to Scudder, the predisposing factors in torsion of the testicle are:

(1) Imperfect descent of the testicle
(2) Abnormally long mesorchium
(3) Abnormally long gubernaculum
(4) Congenital torsion of the cord
(5) Large tunica vaginalis

The exciting factors may be:

(1) Muscular effort, as running, jumping, coughing, straining at stool or coitus
(2) A mechanical twist
(3) Action of cremaster muscle
(4) Application of a truss
(5) Attempts at reduction of a hernia by taxis
(6) Approach of puberty

SYMPTOMS

There is a sudden intense pain in the scrotum which may be followed by nausea and vomiting. Sometimes the pain is referred to the abdomen at onset and may be confused with some abdominal inflammation such as appendicitis. In the recurrent type of torsion of the testicle, pain is of shorter duration; there is usually a history of repeated attacks and the local signs are less intense. There is usually no fever. The pain frequently disappears as rapidly as it appeared.

In torsion of the testicle and hydatid of Morgagni there is swelling, redness and exquisite tenderness of the testicle and scrotum. It is difficult to palpate the epididymis because of swelling and tenderness. The pain is increased by elevating the scrotum. The opposite is true in epididymitis which makes a differentiating point between the two conditions. This is known as Prehn's[4] sign.

The patient's temperature is seldom over 100° at onset, but may increase as the pathological process goes untreated. There are no symptoms of lower urinary tract infection.

DIAGNOSIS

When torsion develops in an undescended testicle differentiation must be made from a strangulated hernia. This is sometimes impossible. Regardless of exact diagnosis, surgical intervention should be immediate.

In torsion of the scrotal testicle or hydatid of Morgagni, the diagnosis of epididymitis is most difficult to rule out. With epididymitis there is often an accompanying urinary tract infection. The onset is more gradual with pain first appearing in the epididymis rather than the entire testicle. The swelling begins in the globus minor and is palpated posterior to the testicle. Elevation of the scrotum relieves pain which is the reverse of Prehn's sign. Rectal examination usually reveals infectious disease of the prostate and seminal vesicles in epididymitis.

PATHOLOGY

The degree of pathology produced by torsion of the testicle is dependent largely upon the degrees of the twist. Torsions of one hundred and eighty degrees or less are not, as a rule, accompanied by anything more than edema. However, as the torsion increases to three hundred and sixty degrees or more, vascular occlusion de-

velops, first venous followed by arterial, then gangrene ensues. Incision into the scrotum reveals edema of all the tissues and bloody fluid of varying amounts in the tunica vaginalis. There is a sharp line of demarcation between healthy tissue above and the strangulated tissue below the point of obstruction. In hydatid of Morgagni the same findings are noted except to a lesser degree and the hydatid is often gangrenous, varying in size from a few millimeters to one centimeter in length.

TREATMENT

Detorsion may be successful in a few of the fully descended testicles which are seen very shortly after the onset of symptoms. In these cases an orchiopexy should be done to prevent recurrence of the torsion. Unless done, such cases are very likely to recur. The majority of cases require surgical intervention as soon as a diagnosis has been made. If, after opening the scrotum and the torsion reduced, the color returns to normal and a healthy blood supply demonstrates itself, fixation of the cord and testicle to the scrotal wall should be carried out. If a return of normal color does not result from reduction, then orchidectomy with resection of the involved cord should be done.

I wish to present four cases of torsion of the testicle and its appendages which have occurred on my service in the past one and one-half years, representing four different types of this condition.

Case 1.—J. H., aged 26, married, was admitted to the hospital on December 20 with the history of pain in the left scrotum of four days' duration. The pain developed suddenly during the night and was followed by nausea and vomiting. There was moderate swelling of the cord and testicle, and manipulation was very painful. Venereal history was negative. Rectal examination revealed a normal prostate and seminal vesicles. The patient's condition improved with rest in bed and evidently the torsion was relieved by manipulation.

He was dismissed from the hospital, but returned fifteen days later with a recurrence of his pain and physical signs. A diagnosis of recurring torsion of the testicle was made. Operation was advised. On opening the scrotum there was no torsion present, but the tunica vaginalis contained clear, straw-colored fluid and the lower portion of the cord was moderately edematous. The tunica was everted and the cord and testicle anchored to the lateral walls of the scrotum. Convalescence was uneventful. Since returning home there has been no recurrence of his pain. This case undoubtedly represents one of the recurring types of torsion.

Case 2.—J. H., aged 15, school boy, was seen March 2, seventy-two hours after he had complained of sudden, severe pain in his right testis. This pain occurred while lying in bed reading. He had been treated since the onset by his family physician with elevation and ice bags to the scrotum. Temperature was 102°. Examination revealed no evidence of urinary tract infection. The prostate and seminal vesicles were normal per rectum. The entire right side of the scrotum was edematous and very painful on manipulation, particularly when elevated (Prehn's sign).

A diagnosis of torsion of the testicle was made and immediate operation performed. Upon opening the scrotum the tunica vaginalis was found to contain about 20 c. c. of bloody fluid. The testicle and epididymis were bluish-black in color. Just above the epididymis and within the tunica vaginalis the cord was twisted two and one-half times in its longitudinal axis. Reduction of the torsion was done. After twenty minutes of warm applications there was no improvement in the color of the epididymis and testicle. Orchidectomy with resection of the involved portion of the cord was done. Convalescence was uneventful.

Case 3.—B. S., aged 16, was admitted to the hospital March 23 with a history of sudden onset of pain in the left testicle while taking a shower bath following archery practice three weeks before admission. On examination at the school infirmary the testicle was found to be swollen and the school physician made a diagnosis of orchitis following an atypical case of mumps. The testicle was treated by elevation and ice bags and the patient held in quarantine for three weeks. Upon his return home from school, examination revealed the skin of the left scrotum firmly adherent to the testicle. The testicle was about twice the normal size and demarcation between the testicle and epididymis was difficult to differentiate. The vas above the testicle appeared normal in size. The scrotum did not transilluminate light.

Diagnosis of torsion of the testicle was made and operation advised. On opening the scrotum, the tunica vaginalis was found adherent to the body of the testicle and the scrotum. The testicle appeared brownish in color and areas of old infarcts were noted. On incising the tunica albuginea there was no bleeding. Just above the epididymis, within the tunica vaginalis, there was evidence of torsion of the cord with a distinct line of demarcation as if a ligature had been tied at that point. It was evident that the testicle was beginning a state of dry gangrene. The testicle and involved cord were resected. Convalescence was uneventful.

Case 4.—J. B., aged 11, was admitted to the hospital October 31 with a history of swelling and pain in the right side of the scrotum of eight days' duration. There was no evidence of injury, but he said he was playing football before the onset of his pain. Ice bag and ichthyol ointment were applied by his family physician with no improvement. Physical examination revealed the right side of the scrotum red and edematous. Manipulation was exceedingly painful. Prehn's sign was absent.

A diagnosis of torsion of the testicle was made and immediate operation advised. Upon opening the scrotum and tunica vaginalis about 15 c. c. of straw-colored fluid were found. The testicle appeared normal. The epididymis was slightly enlarged. At the upper pole of the testicle, just above the epididymis, there was a bluish-black mass the size of a large pea, connected with the testicle by a thin pedicle which had become twisted. The pedicle was ligated and the hydatid removed. The tunica vaginalis was everted and the scrotum closed. The recovery was uneventful.

The pathologist's report was as follows: the specimen consists of a small flat section of dark pink tissue which was smooth and glistening on one side. Microscopically the tissue was necrotic and appeared to be made up of fibrous, connective tissue in which there were a few blood vessels.

CONCLUSIONS

(1) Torsion of the testicle and its appendages is frequently not diagnosed.

(2) Torsion of the testicle and its appendages may occur at any age, but is most frequent in children or young adults.

(3) Torsion of the testicle and its appendages is a surgical emergency.

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DISCUSSION (*Abstract*)

Papers of Dr. Jarratt P. Robertson, Dr. C. J. Reynolds and Dr. Hubert K. Turley. (Paper of Dr. Robertson entitled "Injuries of the Kidney," was published in the JOURNAL for February 1942, page 181.)

Dr. Edgar Burns, New Orleans, La.—Pyelographic findings may be misleading, and must be correlated with the other findings.

A young lady after an automobile accident had a rupture of the right kidney, well shown by intravenous urogram. Her general condition was good at the time of the original examination and remained so. Under conservative treatment she recovered. An intravenous urogram six months after injury showed that the urinary function of the injured kidney had been re-established.

Infection has a great deal to do with stone formation. Hence the importance of eradicating infection in all cases.

A ruptured posterior urethra, like other injuries of the urinary tract, presents more or less of an individual problem. The frequent association of fracture of the bony pelvis and less often of visceral injury makes it impossible to do exactly what one would like to do toward repairing the lacerated urethra.

The method described by Dr. Reynolds seems very simple and apparently his results justify its use. I assume the catheter he is using is a latex catheter, and I wonder whether he finds urethral irritation a troublesome factor. We use those in connection with other types of surgery and get quite a profuse urethral discharge from them. I am wondering if that had anything to do with the later abscess which he mentioned in two or three cases.

I feel safer if I use suprapubic catheter drainage in closing the wound.

I wonder, again, if the cases that developed abscesses later might not have developed the abscess had the suprapubic tube been left in place.

The principle described by Dr. Robertson was suggested by Ormand and Cothran in 1934. They used the Hagner bag. The tube served to splint the urethra, and the bag by gentle traction served to bring the severed ends of the canal together. Of course, that was carried out in connection with suprapubic catheter drainage.

During the past six years, sixteen cases of torsion of the testicle have been treated on the Urological Service at the New Orleans Charity Hospital. In nine of these cases the torsion was complete, requiring orchidectomy for a gangrenous testicle.

The etiology is interesting. Simple movements often produce it, and one of our cases of torsion was produced by massage of an undescended testicle. In another it occurred when the patient crossed his legs while attending a movie. In still another, the patient was playing poker and developed a torsion when he reached for the pot.

I recently had a young chap of twelve years who was quite an enthusiastic football fan. He developed a torsion of the testicle while cheering the Tulane team. Two weeks later he developed a torsion on the other side while attending a football game.

Those are merely sidelights in the etiology of the sixteen cases we have had on our service.

Dr. R. H. Flocks, Iowa City, Iowa.—We treat renal injuries very, very conservatively. We can usually tell whether an emergency is present or not, as far as kidney injury is concerned, from the examination of the patient. If an acute emergency is not present we usually follow the regime of putting the patient to bed; watching him closely; studying him with repeated flat films and intravenous pyelograms; and then following him for several years. This is done not only to observe late deformities, which may cause trouble locally in the urinary tract, but also because of the question of hypertension. In only a few cases have I felt that retrograde pyelograms were necessary in the early stages of a renal injury in order to make an indication for surgical therapy. Retrograde pyelograms, however, are indicated in many of these cases later in order to ascertain definitely the nature of deformities which may have occurred as a result of the injuries. It is surprising, however, how little deformity has been produced by rather severe injury.

One point has proven of extreme help to me in the surgical treatment of patients who have had injuries of the prostatic urethra months before they came to me. In patients who have had an injury to the prostatic urethra months, or years, previously, no attempt has been made to repair this injury and they have simply had suprapubic drainage since the time of the injury. In order to reconstruct the strictured urethra we have performed plastic operations upon the prostatic urethra through a perineal approach and have secured very excellent results in the majority of cases. A problem has been the separation of the rectum from the membranous and prostatic urethra. Because of the tremendous amount of distortion and scarring I have found that the usual perineal approach of Dr. Young has been unsatisfactory in most cases. I have used the technic of Dr. Elmer Belt of Los Angeles where the plane of cleavage underneath the anal sphincter is entered and the rectum is thus displaced downward away from the prostate. By using this technic I have been able to separate the rectum rather easily in every case and then rather easily

to go ahead with the plastic procedure upon the prostatic urethra.

Dr. Monroe Wolf, New Orleans, La.—I wish to be more emphatic than Dr. Turley, especially in regard to making the general medical profession more conscious of the fact that torsion of the testicle does occur.

Many residents and interns say that they have never heard of torsion of the testicle. Recently I referred a patient to the Charity Hospital admitting room with a diagnosis of torsion, and a senior resident in urology sent the patient home with a diagnosis of chronic epididymitis because he had never heard of torsion.

The mistake and delay in diagnosis caused a complete sacrifice of the testicle by orchidectomy or complete atrophy.

In a series of 18 cases, 10 of my own, 5 at Charity Hospital and 3 at Touro Infirmary, there was a sacrifice of 77 per cent because of delay.

A complete resume of 16 of the above cases will appear in a future number of the *American Journal of Surgery*.

On a boy seven and a half months old, the condition followed eight to ten days after circumcision. There was a case below the age of ten, and nine cases occurred between the ages of eleven and twenty.

Dr. George R. Livermore, Memphis, Tenn.—I had a case some years ago in which the urethra was severed behind the symphysis pubis by the sharp edge of a fractured ischiopubic ramus. This permitted the bladder neck to drop down out of line with the urethra. A perineal operation was done. With the index finger passed through the urethra, the severed neck of the bladder could be felt, the finger inserted into it and it was easily brought into line with the urethra. When we attempted to pass an instrument to the bladder, the instant the finger was removed from the bladder neck, it dropped out of line.

The plan used successfully was to introduce a catheter guide which was small and could be passed along the finger through the urethra and on into the bladder neck. As the proximal end of the guide is looped to form a handle, this would not permit a catheter to be threaded over it. With heavy forceps, we straightened out the handle, cut off the tip of a 24 F catheter, threaded it over the guide, which it easily followed on into the bladder, thus holding the severed urethra and bladder neck in apposition. The result was all that could have been desired.

Dr. Robertson (closing).—It is very important that patients who have had renal injuries return for pyelograms at intervals for three or four years. In this way early ureteral obstruction and renal fibrosis will be discovered before destruction of the kidney occurs.

Dr. Reynolds (closing).—As to the question of the latex catheter's being irritating, it has been my experience that any foreign body in the urethra will cause a urethral discharge. I am not convinced that the latex catheter produces more discharge than others. I do not believe the type of catheter used had anything to do with the formation of abscess in three of my cases. I say that because in one case the nature of the injury was recognized only after extravasation had occurred and abscess was a natural sequence. The other two cases developed only after removal of the catheter and in both instances the catheter was removed too early; that is, one in four days and another at the end of five days. The tear in the urethra was not adequately healed and extravasation followed, naturally abscess formation. It is a mistake to remove the catheter too early in partial or complete rupture. To substantiate these opinions I call your attention to the fact that there was no similar occurrence in the six cases which were drained for 21 days with the inlying Foley catheter.

Patients treated in this manner will have a minimum amount of scar tissue formation in the region of the injury, although it is important to follow up with sounds at intervals. Urethrograms made months afterwards show a fairly normal posterior urethra and a minimum amount of deformity. Patients treated by delayed urethral repair usually develop so much scar tissue formation that a satisfactory result is difficult. This does not occur if correction is made immediately in the manner outlined.

Dr. Livermore's case would have been ideal for this type of treatment.

FURTHER EXPERIENCE WITH THE EXCLUSION OPERATION FOR THE TREATMENT OF FISTULA OF THE SMALL INTESTINE*

By E. Lawrence Keyes, M.D.
St. Louis, Missouri

It seems fitting to summarize some of the experiences of St. Louis surgeons with the exclusion operation for the control of fistula of the small intestine. Due acknowledgment is here made them, for allowing their cases to be reported, by mentioning their names chronologically as they have followed the author in performing this operation: Drs. Gerhard E. Gruenfeld, I. C. Middleman, Nathan A. Womack, Carl J. Heifetz, and Peter Heinbecker. The local hospitals concerned are Barnard Free Skin and Cancer, Barnes, Homer G. Phillips, Jewish, St. Louis City, and St. Luke's. Five cases can thus be added to the four reported in Surgery, Gynecology and Obstetrics in February, 1941,[1] evidence of a renewed interest in a procedure devised as long ago as 1885 by Trendelenburg.

The operation follows the principles of a Pavlow pouch, and Puestow[2] has completely excluded segments from the small intestine of animals for physiologic studies. Puestow has also used the operation for fistula of the ileum clinically; and Cokkinis,[3] Colp and Ginsburg[4] are other recent advocates of the procedure.

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*Read in General Clinical Session, Southern Medical Association, Thirty-Fifth Annual Meeting, St. Louis, Missouri, November 10-13, 1941.

*From the Department of Surgery, Washington University Medical School.

The operation has, in our hands, proven invaluable for certain fistulae of the ileum or jejunum which were uncontrollable by other procedures. It is inapplicable to duodenal fistulae because the pancreatic secretions cannot be thus excluded from the alimentary canal without fatality (Elman, McCaughan, and Hartman.[5])

Of the nine fistulae, seven were in the ileum, and two in the jejunum. In the ileum, five were in mid-ileum, two near the terminal ileum. In the jejunum, one was high, one low. All nine fistulae were considered, for practical purposes, to be complete external fistulae, because through them most, if not all, of the contents of the small intestine was lost. Seven were fistulae with spur formation, two were not.

The nine fistulae followed surgery. Four followed exteriorization of gangrenous ileum; two others occurred near the terminal ileum after laparotomy. One laparotomy was an abdominoperineal excision of the rectum for carcinoma; one a complete hysterectomy for corpus carcinoma. In both cases the last loop of ileum apparently prolapsed into the pelvis, causing acute angulation of the terminal ileum, obstruction there and spontaneous perforation of the next proximal loop of ileum. The three remaining fistulae followed operations, one for traumatic perforation of the jejunum by an automobile accident, one for regional enteritis, and one for liposarcoma of the mesentery.

The fistulae occurred in five males and four females, ranging in age from 27 to 71 years. The fistulae were present on an average of 2½ months before exclusion with extremes of two weeks and five months.

In attempts to control these long-standing fistulae, various mechanical devices were used. Thus, sponge rubber plugs closed the ileocolic fistula of Mr. J. H. for about two months. Then, the intestine became irritable, and it would extrude the plug whenever introduced. For feeding, Miller-Abbott tubes, Foley and other catheters placed in the distal loop of the fistula of Dr. A. M. and Mr. E. L. were very helpful.[6] However, tubes to bridge fistulae never worked well,[7] and mechanical devices at best proved useful but for a time.

Operations, some 21 in number, and of many types likewise failed to close the fistulae of this series. A cycle something like this was usual. First, the spur between the exteriorized loops would be crushed. At a later operation the two loops would be dissected free down to or through the peritoneum, freshened, and the intestine carefully sutured; usually the wound would be closed above it. Often, a side-to-side anastomosis would be performed within the peritoneum, well away from the fistula; and the fistulous segment at times freshened and the fistula closed. Sometimes a length of fistulous intestine was resected and the remaining intestine anastomosed. Anastomosis failed because it was performed of necessity on damaged intestine. The suture line would not hold in the presence of inflammation or edema of the intestinal walls, tension on suture lines, inflammation of the mesentery, or obstruction distal to the anastomosis due to adhesions or abscess.

With these fistulae, the skin always was excoriated. Some wounds were infected, and several intraperitoneal abscesses required drainage. Anorexia and vomiting afflicted at least five of the patients, several had diarrhea. Three had no bowel movements whatever because their fistulae were complete. One had bronchopneumonia, one acute parotitis, and several had decubitus ulcers. All suffered nutritional depletion and cachexia of varying degree. This, in brief, was the clinical picture of the nine patients at the time the operation of complete exclusion was performed. Space will not allow discussion of body chemistry or physiology incident to fistula.

Incisions for exclusion were left rectus in 6 patients, right rectus in 2, and transverse in one. The incision was kept as far away from the fistula as possible; hence the preponderance of left rectus incisions, as most of the fistulae had occurred originally in right rectus incisions. The value of keeping the incision well away from a fistula was demonstrated in the case of Mr. E. L., where an incision for the exclusion operation was made so close to the old fistulous incision that pus was encountered, causing postponement of the exclusion operation. In another instance, dense adhesions were encountered, rendering exclusion impossible.

Identification of the two loops of intestine leading to the fistula was sometimes difficult. Of assistance was the insertion of catheters into the two loops through the stoma by an assistant. Further aid in orientation came from a Miller-Abbott tube previously passed nasally downwards as near the proximal loop as possible. The Miller-Abbott tube was also of aid, postoperatively, in relieving tension on the suture line, thus obviating enterostomy.

The question of what to anastomose together next arose. In the mid-ileum, the solution was not difficult and ileo-ileostomy was performed.

In the terminal ileum, the solution was more difficult, because after the distal ileum between the fistula and the cecum had been severed the distal end would retract and leave too short a stump for safe anastomosis; ileocolostomy was performed as an alternate procedure here. In the jejunum, approximation without tension of the two anastomatic loops of jejunum was unusually difficult. This was due in part to adhesions, and in part to the bulk of the intervening mesentery itself.

The chief value of exclusion consists in accomplishing the important thing first, namely: the restoration of intestinal continuity. It leaves for last the less important step, namely: the resection of the fistulous segment of intestine, a step which can, if desired, be postponed to a second stage. The operation begins in a clean field and proceeds towards a contaminated one. It reverses the sequence of the usual operation for fistulous intestine, where the fistulous intestine is first dissected out from a mass of adhesions and where intestinal continuity is restored as the last step. It restores intestinal physiology as the first rather than the last step.

With exclusion, the fistulous intestine can (1) be left *in situ* permanently (2) resected at second stage, or (3) resected immediately following exclusion in one stage. The nine case histories will be given according to these three classes.

(1) COMPLETE EXCLUSION ALONE

With Mrs. A. A. the incision was left rectus. Complete exclusion was done by Dr. E. L. Keyes for a fistula which resulted in mid-ileum from a strangulated ventral hernia. Side-to-side ileo-ileostomy was performed. The two loops leading to the fistula were inverted and dropped back, leaving about three feet of mid-ileum excluded in a blind fistula which has also effectively plugged the hernia for two and a half years since discharge. The patient refuses a second stage operation and her health is good at present.[1]

Mr. J. H. had an exclusion for fistula of exteriorized ileocolostomy stoma for regional enteritis with fistula. The incision was left rectus. Complete exclusion was done by Dr. E. L. Keyes, with ileosigmoidostomy, sigmoid ends transected and inverted. A blind fistula with several feet of completely excluded ileum and colon remain. Resection of this blind fistula is not urged. The patient is healthy and working one and one-half years later.[1]

Mrs. A. C. (Barnard Free Skin and Cancer Hospital, 77440), a 59 year-old white housewife, had a laparotomy on August 26, 1939, through a left pararectus incision for a liposarcoma about 25 cm. in diameter in the mesentery of the jejunum just distal to the ligament of Treitz. In removing this the blood supply to a portion of the jejunum was damaged. It became necessary to exteriorize the damaged jejunum. To close the resulting fistula, laparotomy was performed September 22, 1939, with an end-to-end anastomosis. This broke down. On November 1, 1939, laparotomy was done (difficult due to adhesions), with side-to-side intraperitoneal anastomosis and closure of the fistulous opening. There was recurrence. At laparotomy December 6, 1939, the stoma was closed. It broke open again. On January 20, 1940, Dr. Gruenfeld performed the operation of complete exclusion, with jejunojejunostomy, and inversion and replacement of two stumps of jejunum leading to the fistula. The anastomosis was unsatisfactory because the proximal jejunum at the ligament of Treitz was too short. Postoperatively, the fistula recurred; a jejunostomy for feeding purposes was performed February 10, 1940, but the patient died February 19, 1940. There was no necropsy.

J. A., a 35-year-old negro man (Homer G. Phillips Hospital case E-5596), on August 28, 1940, had a laparotomy through a right rectus incision for acute intestinal obstruction. About a foot of mid-ileum was found herniated through a congenital ring in the mesentery and twisted several times. The hernia was reduced and the volvulus untwisted; the intestine appeared viable and was replaced in the abdomen, and the wound closed. The postoperative course was stormy and on September 3, 1940, the wound opened, a fecal fistula developed, and on September 11, 1940, about 6 centimeters of devitalized intestine presented in the wound and had to be excised. A large fecal fistula with numerous orifices developed and no stools were passed by rectum thereafter, the fistula being complete. This was demonstrated by roentgenograms. Mechanically plugging the fistula caused acute obstruction which was relieved immediately by unplugging the fistula. Obviously, there was a kink in the terminal ileum beyond the fistula causing complete obstruction here. The

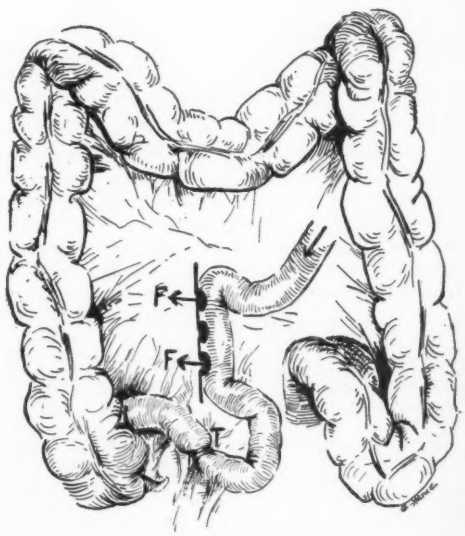


Fig. 1

Multiple fistulae of mid-ileum, with distal obstruction near terminal ileum, T. Fistula complete, with many openings on abdominal wall (J.A.).

course was prolonged with profound nutritional depletion. On February 12, 1941, Dr. Carl Heifetz performed exclusion. Through a left rectus incision well away from the excoriated skin, he felt a mass of adhesions about the terminal ileum and cecum; the hepatic flexure was the first free segment seen. He followed the proximal loop down to the fistula as far as possible and divided the ileum here between clamps and turned the distal end in. He brought the proximal ileum up to the transverse colon and did an isoperistaltic side-to-side anastomosis and closed the wound. (*Fig. 1*). While this operation was anatomically a partial, not a complete exclusion, because the transverse colon was not cut through and inverted, yet it actually functioned as an operation of complete exclusion, because it had been demonstrated before operation that there was complete obstruction at the terminal ileum. The point of obstruction acted as though the ileum had been completely severed here, and, for practical purposes, effected complete exclusion (*Fig. 2*). Following operation, the course was uneventful and the patient was discharged February 28, 1941, much improved. A month and a half later he had gained much weight. A second-stage excision of the blind fistulous segment of intestine is advised when the patient reports to the hospital in future.

M. E. (Barnard Free Skin and Cancer Hospital 82583), a 70-year-old watchman, was admitted December 9, 1940, with adenocarcinoma of the rectum. On December 11, 1940, an exploratory laparotomy and colostomy of the Lahey type was performed, followed on January 4, 1941, by a one-stage abdominoperineal excision of the rectum. The latter operation was difficult because the tumor was partially fixed and almost inoperable. On January 15, 1941, an abscess of the right lower quadrant was drained through a McBurney incision. A fistula presented here and also burrowed to the left rectus incision, and the colostomy ceased to function (*Fig. 3*). The fistula was a complete external fistula of the lower third of the ileum. The patient also developed bronchopneumonia and edema of the lower extremity, and although he was failing rapidly, exclusion was considered advisable for nutritional purposes. On January 29, 1941, Dr. E. L. Keyes performed the operation of complete exclusion (*Fig. 4*), through a right rectus incision. He identified the ileum proximal to the fistula, cut it across and anastomosed to the transverse colon, likewise severing the transverse colon and inverting both ends. Postoperatively, the anastomosis functioned and bowel movements again became established through the colostomy stoma. The right rectus wound, however, disrupted on February 3, 1941, and the patient died February 5, 1941. Necropsy revealed metastatic carcinoma of the liver and lungs, pneumonia, empyema, and thrombophlebitis of the right common iliac vein. There was no peritonitis.

E. L. (Barnes Hospital 87302), a 27-year-old white oil-field "rough-neck," was admitted January 29, 1941, following an automobile accident twenty-four hours previously. With a diagnosis of generalized peritonitis, he was explored several hours after admission, and three perforations were found low in the jejunum. An enterostomy tube was sewed into one perforation of the jejunum, after an unsuccessful attempt had been made to close the two other perforations, and it was necessary to exteriorize the damaged intestine because of impaired mesenteric circulation. A general peritonitis was present and sulfanilamide crystals were used. Extreme nutritional depletion resulted and the patient was kept alive only by the devoted care of the nursing and house staffs, particularly by the attention of Dr. Frank

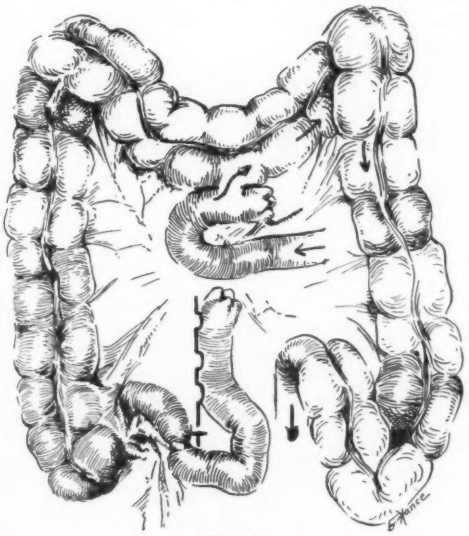


Fig. 2

Exclusion of fistulae shown in *Fig. 1*. Illeocolostomy, with inversion and replacement of distal ileum. Exclusion here is physiologically complete because of complete obstruction at terminal ileum, T. Exclusion is anatomically incomplete because intestinal continuity between ileocolostomy stoma and fistula has not been severed.

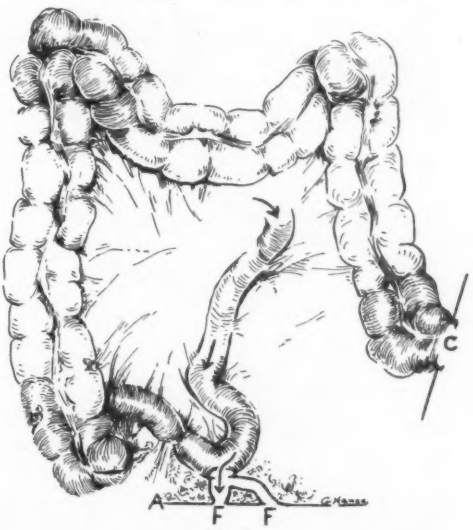


Fig. 3

Fistula of lower ileum following abdominoperineal excision of the rectum. A, abdominal wall. Fistula is complete; colostomy, C, functionless. (M.E.).

H. Kidd, Jr. Feeding of succus entericus, amino-acid mixture, and so on, into the distal loop, repeated transfusions of whole blood, amino acids and plasma, were among the many procedures used. The patient developed atelectasis of the lung. The spur between the two loops was clamped and the stoma plugged, with varying degrees of success. On February 18, 1941, laparotomy was performed in the hope of being able to use complete exclusion. However, the left rectus incision was made too close to the original right rectus incision and a pus pocket was entered, causing abandonment of the idea of exclusion. This wound was closed and the old right rectus wound entered, and the two fistulous loops of intestine freshened and sutured. The fistula recurred and on February 21 another attempt to close the fistula proved unsuccessful. On February 23, an extensive laparotomy was undertaken through the original right rectus incision. The two loops of intestine were followed down and excised, and the remaining proximal and distal loop were turned in and anastomosed side-to-side. Again the fistula recurred, due, it was thought, to a blow-out of one of these loops. On March 1, 1941, this blown-out loop was closed at operation, but again it reopened and other attempts at closure were made on April 7, April 9, and April 12. On April 22, 1941, Dr. Peter Heinbecker successfully performed the operation of complete exclusion. He performed a transverse incision, and, with great difficulty, because of adhesions and pus, identified the proximal and the distal limbs of jejunum leading to the fistula. He cut across the two loops and anastomosed them end-to-end, thus restoring the intestinal continuity. He was able to resect most but not all of the fistulous intestine, and ended by exteriorizing the two open ends of unremoved intestine. The condition was critical following operation and a subphrenic abscess developed,

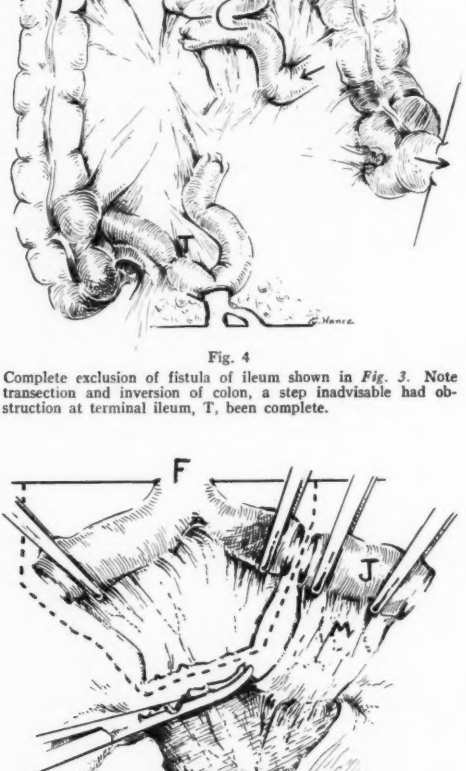


Fig. 4

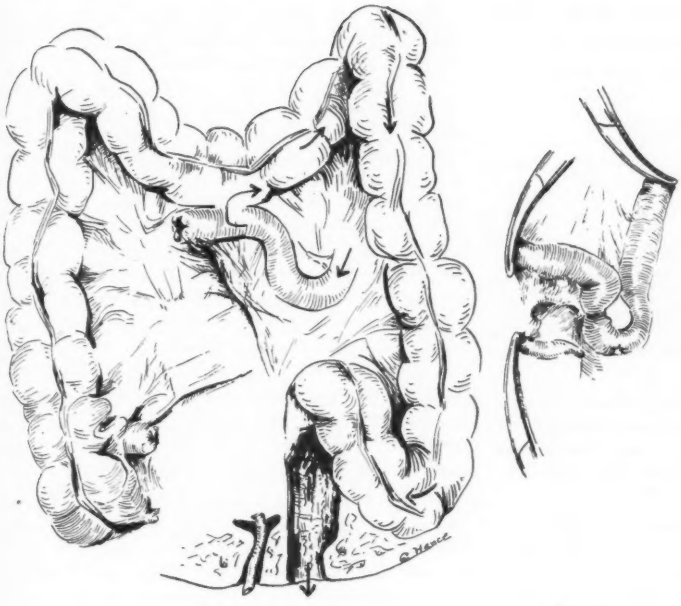
Complete exclusion of fistula of ileum shown in *Fig. 3*. Note transection and inversion of colon, a step inadvisable had obstruction at terminal ileum, T, been complete.

Fig. 5

Fistula, F, low in the jejunum. Complete exclusion operation with end-to-end anastomosis of jejunum, resection of fistulous intestine (dotted lines) and exteriorization of remaining jejunum, J. This fistulous segment to be resected at a later stage; its blood supply remains intact through the mesentery, M. (E.L.).

Fig. 6

Complete ileovaginal fistula, F, following panhysterectomy, with complete obstruction from angulation at T. (M.M.).



A B

Fig. 7-A

One-stage operation for fistula shown in *Fig. 6*. Step (A), complete exclusion by ileocolostomy and inversion of stump of terminal ileum which proved too short for originally planned ileo-ileostomy.

Fig. 7-B

Step (B), showing segment of ileum and incorporated appendix resected.

followed by empyema, both of which required operation. The patient was discharged August 8, 1941, and writes that he is well and working three months later. It is recommended that he return for excision of the blind fistulous segment of intestine.

(2) TWO-STAGE (a) EXCLUSION, (b) EXCISION OF FISTULOUS SEGMENT

Dr. A. M. had the first stage, namely: complete exclusion with ileo-ileostomy, performed by Dr. I. C. Middleman, because of a fistula of the mid-ileum from exteriorized gangrenous intestine. Left rectus incision was made. The patient was discharged and returned ten weeks later, at which time the fistulous intestine was easily resected and the patient discharged. The patient is well one and one-half years later.[1]

(3) ONE-STAGE OPERATION: COMPLETE EXCLUSION, THEN EXCISION OF FISTULOUS INTESTINE

Dr. Womack's Case.—Exclusion of fistula of the mid-ileum was performed through a left rectus incision. Side-to-side ileo-ileostomy was done, leaving the fistulous intestine and its mesentery untouched until anastomosis was completed. The patient at this time being in good condition, the fistulous intestine was resected and the fistula controlled by this procedure.[1]

Mrs. M. M. (Barnard Free Skin and Cancer Hospital 80658), a 62-year-old white housewife, had been given 2,134 roentgen units of radiation through four portals for adenocarcinoma of the uterus. On August 10, 1940, she received a dosage of 3,600 milligram-hours of intra-uterine radium. On January 22, 1941, panhysterectomy was done. On February 7, 1941, a pelvic abscess developed which was drained through the vault of the vagina. A complete fistula developed here and all the fecal stream passed out through the vagina and no stool was passed by rectum (*Fig. 6*). On February 22, 1941, Dr. E. L. Keyes performed a laparotomy through a right rectus incision. The ileum proximal to the fistula was divided and the ileum distal to the fistula was divided. It was planned to anastomose the divided ends, but it was found that too little terminal ileum remained for anastomosis. Consequently the ileum proximal to the fistula was brought up and anastomosed to the transverse colon side-to-side and the stump of terminal ileum was turned in. The operation of complete exclusion was thereby performed (*Fig. 7-A*). However, the patient's condition was good at this point and therefore the fistulous segment of intestine and attached appendix was dissected out of the pelvis and the incision carried through the mesentery to remove the fistulous intestine (*Fig. 7-B*). The patient had an uneventful convalescence and was discharged April 8, 1941.

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THE USE OF STILBESTROL FOR THE TREATMENT OF THREATENED AND HABITUAL ABORTION AND PREMATURE LABOR: A PRELIMINARY REPORT*

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Houston, Texas

Threatened and habitual abortions and premature labor still comprise one of the important problems in gynecology and obstetrics today because it is said that approximately 200,000 babies are lost every year due to spontaneous abortions.[1 2 3]

There are many causes: germ plasm defects; displacements; inflammation of the genital tract; infectious diseases; tumors of the genital organs; dietary deficiencies; endocrine disorders, and other causes.

Corpus luteum has been shown experimentally in animals to be necessary for the maintenance of normal pregnancy. The corpus luteum in humans remains until about the second or third month of pregnancy and then begins to degenerate slowly until the seventh month, when there remains little evidence of its activity. Evidently the placenta takes over the function of the corpus luteum in humans, as there are cases on record where both ovaries were removed early in pregnancy without any ill effect upon the progress of the case.

Mason[5] believes that recurring abortions are due to diminished progesterone influence upon the uterine glands. In other words, the corpus luteum seems to be at fault. He also suggests that abortions occur because the corpus luteum ceases to function too soon or the corpus luteum function of the placenta develops too slowly. This may be due fundamentally to an insufficiently fertile deciduum or to direct injury to the embryo, or both. In those cases where examination of the premenstrual endometrium shows evidence already of corpus luteum deficiency, the damage resulting in abortion at this usual time may be gradual in its effect, and cumulative, in the decidua or in the embryo and its nutritive processes, that is, the trophoblast or developing placenta (Mason).

Heckel and Allen[6] have shown that the injection of estrogenic hormone beginning on the eleventh day of pseudopregnancy in rabbits prevents regression of the corpus lutea and that corpora caused to persist by the injection of estrogens are functional. Such corpora lutea on the twenty-sixth day after a sterile mating usually are indistinguishable from those of pregnancy of similar duration and their functional activity is shown by the observation of the uterus and endometrium. The uterine muscle remains insensitive to pituitrin *in vitro*, and the endometrium, retaining some proliferation, takes on the appearance of that of the sterile horn of a unilateral pregnancy of the same age. Normally in the absence of the injection of estrogens, the corpora become non-functional on the sixteenth and seventeenth day, the uterus promptly becomes sensitive to pituitrin, and the endometrium reverts to the unproliferative estrous condition.

In a previous publication it was suggested by the author that menstruation, labor and uterine bleeding occur at a certain blood estrogenic level. It was also suggested that labor, menstruation and uterine bleeding are due to a ratio of estrogens to sodium-calcium, potassium, magnesium and phosphorus ions, an estrogenic ionic shift (*Charts 1, 2, 3* and *4*).[7]

It is the impression of the author that it is the withdrawal of the estrogen that is important among the endocrine causes of premature labor and threatened and habitual abortions. Uterine contractions are relieved immediately by the injection of estrogen or stilbestrol. We are at present studying this problem through the kind cooperation of Miss Miller Hutcheson, M.T., of the Hutcheson X-Ray and Clinical Laboratory, Houston, Texas.

CLINICAL OBSERVATIONS

About three years ago it was discovered in the Menstrual Disorder Clinic, Jefferson Davis Hospital, Houston, Texas, that if 10.0 to 25.0 milligrams of stilbestrol in oil were given into the anterior wall of the cervix, functional uterine bleeding stopped almost immediately, so a rule was made that all women coming to the Emergency Room, Gynecological or Menstrual Disorder Clinic were to receive an injection, into the anterior wall of the cervix of 25.0 to 200.0 milligrams of stilbestrol in oil, the doses varying according to the amount of vaginal bleeding present. It was believed at first that all uterine bleeding could be controlled by large doses of stilbestrol given into the anterior wall of the cervix.

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*Read in Joint Session, Section on Obstetrics and Section on Gynecology, Southern Medical Association, Thirty-Fifth Annual Meeting, St. Louis, Missouri, November 10-13, 1941.

*From the Menstrual Disorder Clinic, Research Division, Jefferson Davis Hospital, Houston, Texas.

This, we found, not to be true, but we observed that stilbestrol would stop normal or abnormal uterine contractions and this led to the observation that stilbestrol may be used for the treatment of threatened and habitual abortion.

Fifty-nine cases of inevitable abortion were seen in the Jefferson Davis Hospital, Houston, Texas. These cases were given from 25.0 to 100.0 milligrams of stilbestrol in oil into the anterior wall of the cervix upon arriving at the hospital. All of these women were having labor pains and some vaginal bleeding. Much to our surprise, after stilbestrol was given the labor pains stopped almost immediately or within 30 to 60 seconds, and did not recur for from 5 to 51 hours. The stopping of labor pains by an estrogen is just opposite to what we have been taught to expect. It has been taught, as you know, that estrogens will produce abortion. Papers have been published by Zondek, Parkes, Kelly and Aschheim and others to this effect after studies upon animals, and the results have been carried over to humans.

Upon abdominal palpation, it was noted that the hard contracting uterus came out of the spasm of contraction and assumed the normal soft consistency of a pregnant uterus, during and after the injection of 25.0 to 100.0 milligrams of stilbestrol into the anterior wall of the cervix. Normal rhythmic contractions apparently occurred, as far as we could tell by abdominal and vaginal palpation and x-ray examination. The uterine cramping pains were immediately relieved and remained relieved from 2 to 24 hours or even longer in a few cases. A spinal needle and a 10 c. c. syringe must be used to inject the stilbestrol, because of the depth of the anterior wall of the cervix in the vaginal vault.

A patient with threatened abortion who had been spotting for 8 days came to the emergency room. Her condition was diagnosed ectopic pregnancy because of the pain and spotting. She was rushed to the operating room and an exploratory laparotomy was immediately done. Upon opening the abdomen we found a uterus which was so firmly and continuously contracted that it was quite blanched. There was no ectopic pregnancy. One hundred milligrams of stilbestrol (4 c. c. in olive oil) was given directly into the anterior wall of the uterus. The uterus came out of its contracted state and assumed its normal bluish pregnant appearance. The patient was about three months pregnant. The abdomen was closed and the patient was sent back to the ward. The patient is still pregnant and is about due to deliver.

Ten cases of threatened, and seventy-six cases of complete or incomplete abortion came to our hospital because of uterine bleeding and pain. These were also all given 50.0 to 200.0 milligrams of stilbestrol (2 to 6 c. c.) into the anterior wall of the cervix. In these cases the

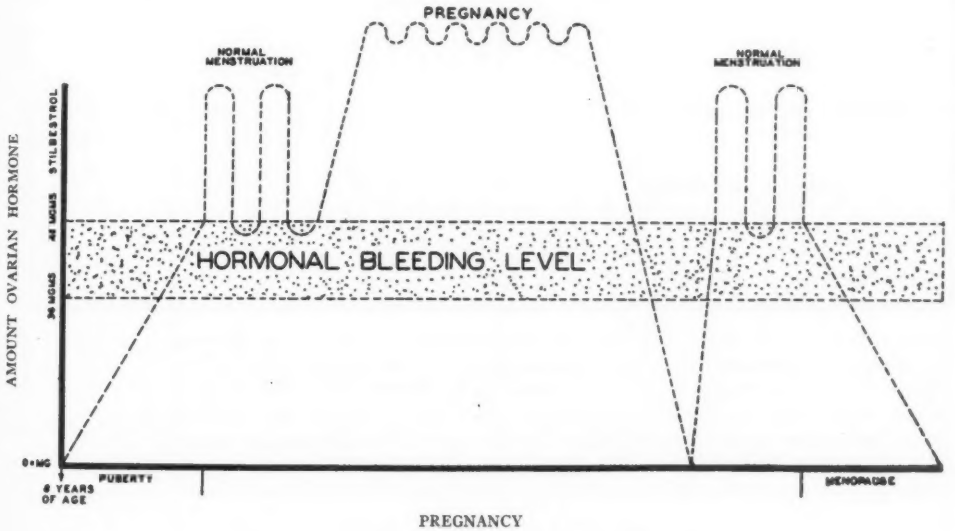


Chart 1

The estrogenic level during normal menstruation and pregnancy. The pregnant woman does not menstruate because the estrogenic blood level is above the estrogenic bleeding level.

uterine pain was relieved immediately. Four of the threatened abortions were carried to term by giving 5, 5-milligram tablets of stilbestrol by mouth along with the cervical injection, plus 2 5-milligram stilbestrol tablets every 15 to 30 minutes until the pain was again relieved. The patient was instructed to carry 5-milligram tablets of stilbestrol with her at all times. Some of the patients who were not given more stilbestrol, other than the first injection into the cervix, aborted after the effects of the injection wore off.

After these clinical observations, the author suggested that all cases of threatened and habitual abortion be sent to the Menstrual Disorder Clinic for further study. Stilbestrol was furnished free to Houston physicians for their private cases of threatened and habitual abortion and premature labor. The author has had five such cases referred to him. All are under control with stilbestrol.

A patient of Dr. S. W. Thorn was three months pregnant when she began to have labor pains and spotting. This patient was given $25.00 worth of corpus luteum and yet she kept on having labor pains and spotting. Then 25.0 milligrams of stilbestrol in oil were given into the anterior wall of the cervix and 5, 5-milligram stilbestrol tablets were given by mouth. The pain of uterine cramping was gone in 45 seconds by the watch. She was also given 2, 5-milligram stilbestrol tablets every 15 to 30 minutes for 6 doses. She was instructed to take 5.0 milligrams of stilbestrol twice a day for 10 days. This patient had had a previous miscarriage about 12 months before at the third month of pregnancy. At the fourth month of pregnancy she experienced another attack of uterine cramps and pain. This attack was as severe as that in the third month. Another 25.0 milligrams of stilbestrol in oil was given into the anterior wall of the cervix and 5, 5-milligram stilbestrol tablets by mouth. She then took 2, 5-milligram stilbestrol tablets every 15 minutes for 6 doses and 2, 5-milligram stilbestrol tablets every morning for 10 days. In the fifth, sixth, and seventh months she had other attacks of uterine cramps but no bleeding. In this case, the farther along the pregnancy advanced the less severe the attacks became. So smaller amounts of stilbestrol were given to control the uterine pains. During the attacks of the fifth, sixth, and seventh months she had to take only 5 5-milligram tablets of stilbestrol by mouth and 2, 5-milligram tablets every two hours for 6 doses. The patient delivered a normal six-pound baby boy on June 15, 1941, at 7½ months. The baby is now about 5 months old, normal in every way, and doing well.

It was observed in this case that uterine cramps started just about the time menstruation would have appeared. This led us to believe that there is a hormone, or glands, that causes an estrogenic withdrawal, or estrogenic waves, with resulting labor pains if the patient is pregnant, and uterine bleeding if she is not pregnant.

Another patient of Dr. Thorn, Mrs. P., aged 30, began to have uterine cramping pains in the fourth month of pregnancy. She was given 1, 5-milligram stilbestrol tab-

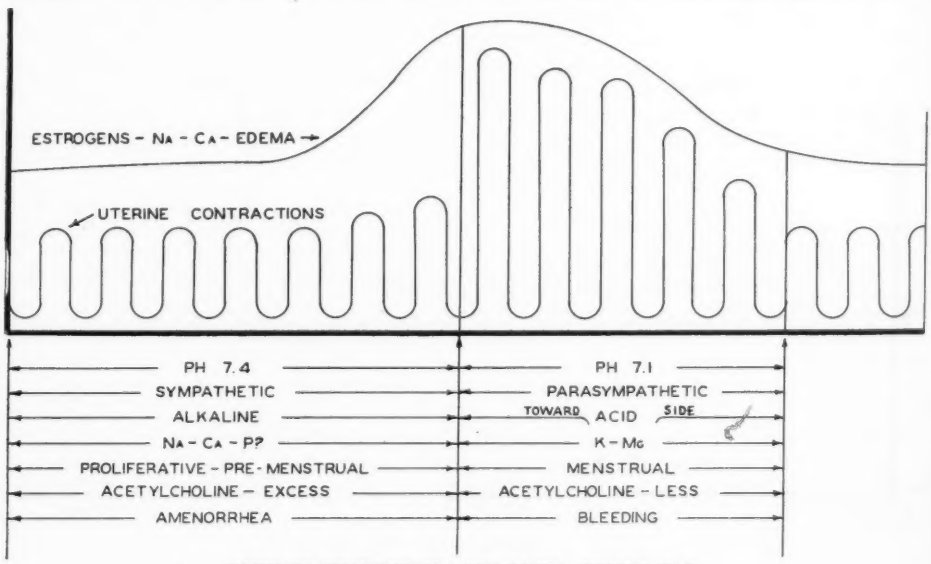


Chart 2

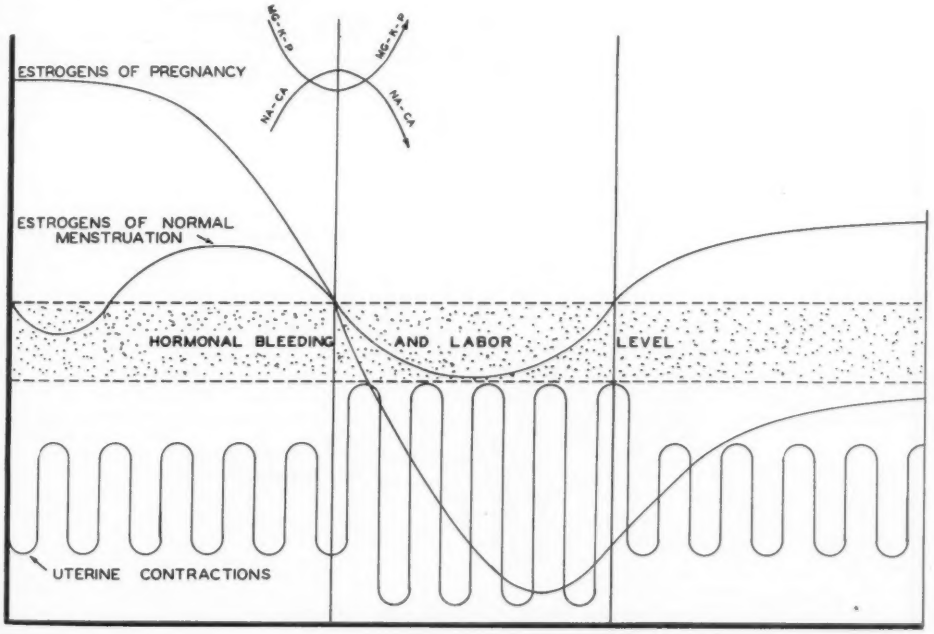
A chemical, neurogenic and pathological analysis of menstruation and labor.

let every 30 minutes for 6 doses and then one every 2 hours until uterine cramps were relieved. The pains were relieved in two and one-half to three hours. She is now at term and due. She has had no further trouble. The patient carried 5 milligram stilbestrol tablets with her at all times.

In one of the author's cases, a 5-month fetus, known to be dead, was in the uterus, and the cervix had dilated to about 3.5 cm. In this case, 2,000.0 milligrams of stilbestrol were given intramuscularly and by mouth between 10 p. m. and 2 a. m. This did not stop the labor pains and the patient aborted.

The above case does not prove anything, but it may suggest that we should treat these cases, because, if we have an abnormal or dead fetus, it will pass regardless of what we do. In regard to carrying an abnormal baby, as suggested by Mall, Streeter, and others, Shute believes that progesterone and vitamin E may supply enough nutritive elements to the fetus to check the abnormally developing fetus and produce a normal child. Stilbestrol is very reasonable in price, non-toxic, and has not caused nausea in any of these pregnant women. If stilbestrol does not produce nausea, the patient then should be suspected of being pregnant.

There were 19 cases of threatened, 2 cases of premature labor, and two cases of habitual abortion treated by injection, plus the stilbestrol orally, the so-called continuous treatment method. The first group of cases was given only the injection, and 6 of them aborted. This second group of twenty-three cases was given the first injection, plus more stilbestrol by mouth or intramuscularly. There were 5 cases where the fetus passed regardless of treatment. These were the cases where threatened abortion had apparently passed over into the inevitable abortion stage. There was one dead baby as mentioned above. The two habitual abortion cases have gone to full term. One of these habitual abortion cases was a chronic nephritic who had previously lost 7 children. She was carried to full term and delivered of a normal baby weighing 7 pounds. The author has a private case of habitual abortion taking stilbestrol at the present time. The patient has had 3 miscarriages; she started having labor pains as with the other miscarriages and we gave her 10.0 milligrams of stilbestrol every night for two weeks and a 100.0 mg. intramuscularly every day. So far stilbestrol has con-



CAUSE OF MENSTRUATION AND LABOR

Chart 3

The cause of labor is apparently due to the withdrawal of estrogens. Labor apparently occurs at the "blood estrogenic labor level" which is the same as for menstruation and uterine bleeding which may vary from day to day and in each individual.

trolled the uterine labor pains completely. She still takes 10 mg. stilbestrol every night.

Some of our patients who are cases of habitual abortion, and who are still pregnant, are carrying stilbestrol with them which may be taken at once.

There were two cases which went into labor at 7 and 7½ months, respectively. They were treated like the cases of threatened abortion. They both delivered at 8 months. The babies were normal.

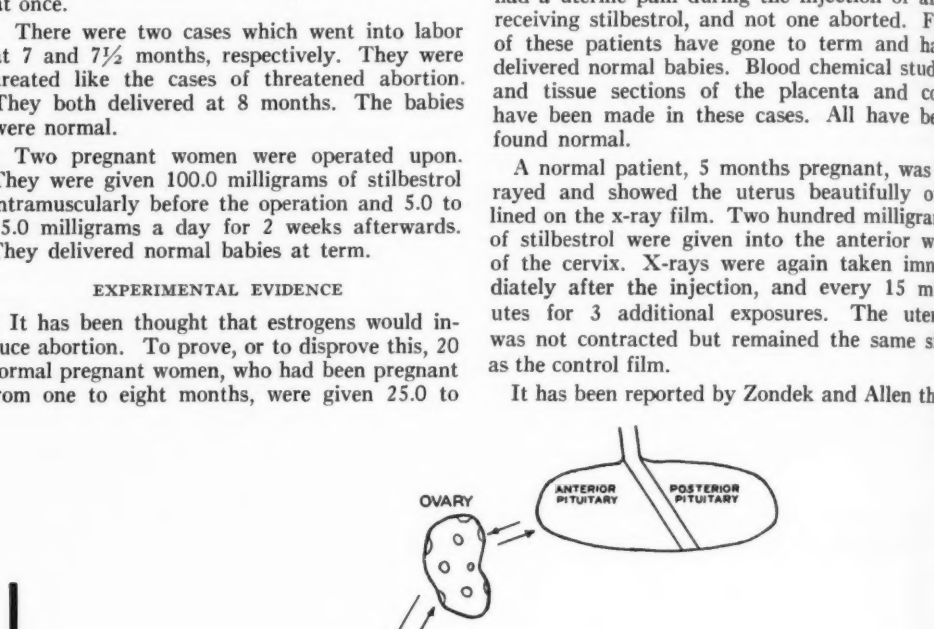
Two pregnant women were operated upon. They were given 100.0 milligrams of stilbestrol intramuscularly before the operation and 5.0 to 25.0 milligrams a day for 2 weeks afterwards. They delivered normal babies at term.

EXPERIMENTAL EVIDENCE

It has been thought that estrogens would induce abortion. To prove, or to disprove this, 20 normal pregnant women, who had been pregnant from one to eight months, were given 25.0 to 250.0 milligrams of stilbestrol into the anterior lip of the cervix, or intramuscularly, or by mouth twice a week for 4 to 12 weeks. Some of these cases received only the first 25.0 or 250.0 milligram injection. Not one of these women ever had a uterine pain during the injection or after receiving stilbestrol, and not one aborted. Five of these patients have gone to term and have delivered normal babies. Blood chemical studies and tissue sections of the placenta and cord have been made in these cases. All have been found normal.

A normal patient, 5 months pregnant, was x-rayed and showed the uterus beautifully outlined on the x-ray film. Two hundred milligrams of stilbestrol were given into the anterior wall of the cervix. X-rays were again taken immediately after the injection, and every 15 minutes for 3 additional exposures. The uterus was not contracted but remained the same size as the control film.

It has been reported by Zondek and Allen that



CAUSE OF LABOR AND MENSTRUATION

Chart 4

Labor and menstruation should be looked upon as an estrogenic ionic relationship. The pituitary and ovary show how they may influence labor, menstruation and uterine bleeding.

estrogens given to rabbits caused death of the fetus *in utero*. We have carried out similar experiments in 12 rabbits and have observed similar results. We gradually and carefully increased our doses of stilbestrol to women. We gave 10 pregnant women, who needed a therapeutic abortion, at first 0.1 to 5.0 milligrams of stilbestrol every day, and gradually increased the dose every week until they were getting 25.0 or more milligrams per day. Not one case aborted. Incidentally, we noticed that those who were nauseated were relieved of their symptoms. This suggests that stilbestrol may be used for the treatment of nausea in pregnancy. Not one of the babies has died in these cases. Three of the author's private cases of threatened abortion, who have received stilbestrol, had normal healthy babies. None of the babies born at the hospital were abnormal, according to the attending pediatrician. The babies, whose mothers are still receiving stilbestrol, are all alive judging from the fetal heart rate and x-ray findings. The mother reports fetal movements. There has not been any increase or decrease in the activity of the child according to the history of the mother.

A patient was given 150.0 milligrams of stilbestrol almost every other day, beginning 8 days before the expected date of confinement. She was due on June 5. Fourteen days later she had had no labor pains. She had received 750.0 milligrams of stilbestrol. The stilbestrol was stopped and she began to have labor pains in about 36 hours. One hundred and fifty more milligrams of stilbestrol were given intramuscularly as soon as the pains started and every day for 5 days. The labor pains stopped within 15 minutes. The patient was again given daily 100.0 milligrams of stilbestrol by mouth from June 11 through June 25. At about 2:55 a.m., on June 26 she delivered a boy weighing 8 pounds and 2¾ ounces. The author was present. Labor was normal. Duration of labor about 18 hours. Sections of the cord and placenta were reported normal. Labor was prolonged 21 days.

Many blood chemical studies were done on this patient, and she was carefully watched. No abnormal changes were observed. This patient was seen in the Menstrual Disorder Clinic for sterility for more than a year before she became pregnant, and her menstruation had been charted. It was very regular.

Dr. G. B. Thomas had a case of threatened abortion in which uterine pains began at approximately 6½ months. The patient was given 100.0 milligrams of stilbestrol intramuscularly every day for two months. She delivered a normal male child weighing 7½ pounds at 8½ months of pregnancy. She received approximately 6,000.0 milligrams of stilbestrol. The child and mother are normal and doing well.

About two weeks ago the author was called to see a negro woman who was about four months pregnant and who had been bleeding and having labor pains for about 36 hours. Upon examination of the clinic chart it was found that she had a 4-plus Wassermann. The patient was bleeding about twice the amount that she normally bled at menstruation. The cervix was dilated approximately 1.0 cm. Two hundred and fifty milligrams of stilbestrol (10 c. c. in olive oil) was given into the anterior lip of the cervix with ease. The severe uterine pains which had been coming on every 3 to 4 minutes for the previous 12 hours stopped immediately and remained stopped for 4 hours and 45 minutes. When they returned they were very mild. Fifty hours and fifty minutes later she had a similar attack of severe uterine cramping pains. She was given 350.0 milligrams of stilbestrol intramuscularly. The pains stopped in about 25 minutes. The bleeding checked to where she was only spotting.

Bed rest, thyroid and vitamins should be given if indicated in these cases. No other medication was used during the first twenty-four hours in the above cases.

CONCLUSIONS AND SUMMARY

The new synthetic estrogenic hormone, stilbestrol, can be used for the treatment of premature labor, threatened and habitual abortion. Cases of threatened and habitual abortion having severe labor pains and some vaginal bleeding, are treated by giving 25.0 milligrams of stilbestrol into the anterior wall of the cervix and 5, 5-milligram stilbestrol tablets every 15 minutes as long as there are any uterine pains. If the pain returns and is severe, the 5, 5-milligram stilbestrol tablets are taken every 15 minutes until the pain is entirely gone. After the pain is gone, 10-milligrams stilbestrol in tablet form is taken every hour for 6 doses and then 5 mg. every hour for 6 doses. Then 10 mg. every night until the eighth month. The injections may be skipped and only the tablets used if the patient is seen early and the pain and bleeding are mild. It depends entirely upon the case. We can give too little stilbestrol but we cannot give too much.

In habitual abortion cases, 10 milligrams of stilbestrol are given once or twice a day as soon as pregnancy is diagnosed. The patient is to take 2, 5-milligram stilbestrol tablets every day for at least seven months.

Uterine pains of threatened, habitual, complete and incomplete abortion, and normal labor pains can be stopped immediately by giving 25.0 to 100.0 to 200.0 milligrams of stilbestrol in oil into the anterior wall of the cervix. Hard contracted uteri of abortions can be made to soften and assume their normal consistency within 30 to 60 seconds and remain so for 6 to 8 to 24 hours or longer.

Stilbestrol apparently works by (1) keeping or raising the blood estrogenic level above the estrogenic labor level; or by (2) keeping the so-

dium, calcium, potassium, magnesium and phosphorus ions from being concentrated at the level which produces uterine contraction; or (3) by keeping the estrogenic-ionic ratio from being optimum for labor, or (4) stilbestrol may stimulate the corpus luteum to produce more progesterone (Allen).

It may be that stilbestrol prevents the destruction of progestin. Many experimental studies have shown the complementary physiologic effects of estrogen and progestin (Smith and Smith). Judging from this, it may be better to give both estrogen and progestin. So far we have experimented with stilbestrol only and believe that it is the only hormone needed. Progesterone gave us previously poor results in our private practice.

Stilbestrol may cause an increased utilization of the pregnancy gonadotropic factor. It has been suggested by Browne and Venning in 1936, that there is an active utilization of the chorionic gonadotropin in the placenta for the production of estrogen and progestin.

A deficiency of estrogen and progestin apparently results in an abnormal metabolism of both, involving less complete conversion and utilization and more rapid destruction. Such changes in these compounds occur at normal and premature delivery. Stilbestrol may cause more complete conversion and utilization and less rapid destruction of progesterone and estrogens. Labor has been prolonged by the giving of large doses of stilbestrol, so the increase in estrogens is apparently not the cause of labor.

Stilbestrol, a synthetic estrogen, may replace the rapidly destroyed natural estrogen and in turn stimulate the placenta directly to produce more progestin and estrogen, or indirectly may cause the placenta to utilize the chorionic gonadotropin to produce both estrogen and progestin.

More than one hundred and fifty cases of abnormal uterine contractions and pains have been stopped by stilbestrol.

Stilbestrol, being very economical and nontoxic, as well as non-nausea-producing in the pregnant woman, may replace corpus luteum altogether for the treatment of threatened and habitual abortions and premature labors.

No deaths *in utero* have been observed after 25.0 to 6000.0 milligrams of stilbestrol in twenty cases of normal pregnancy, so stilbestrol in therapeutic doses apparently will cause no harm.

Sixteen normal children have been born to sixteen mothers who have had large doses of stilbestrol because of threatened, habitual abortion, or premature labor. About ten similar cases are still under observation.* No harm has been observed from these large doses of stilbestrol from our previous studies on animals and a large series of gynecological cases (2,000) receiving large doses of stilbestrol over a long period of time (two to twenty-four months).

Stilbestrol, a synthetic estrogen, will not cause abortion or severe uterine contractions, but produces normal rhythmic contractions if the uterus is in a state of contraction, and no change in contractions if the uterus is contracting normally.

Because of the frequency with which threatened abortion is controlled with bed rest and sedatives it is not easy to evaluate accurately the value of hormones in these cases. Most of our cases were ambulatory so I believe they would have aborted.

Cramping uterine pains of an abortion can be controlled with stilbestrol. The result is immediate, so estrogen may be the essential hormone. Large doses of progestin are being experimented with at present.

Sterile patients who become pregnant after study are now given 10.0 mg. of stilbestrol by mouth every night for at least 7 months. If uterine pains or bleeding start at any time 5, 5.0 mg. tablets are taken immediately and repeated every 15 minutes until the pain or bleeding or both are gone. Then 10.0 mg. every hour for 6 doses. Then 5.0 mg. every hour for 6 doses. Then 10.0 mg. every night until 8 months.*

This paper is dedicated to Dr. Willard R. Cooke, Dr. H. Reid Robinson, Dr. J. L. Jenkins and Dr. R. Lee of Galveston, who encouraged me in my earlier years of research. Many thanks are due to the residents, interns, nurses, and Dr. Donald Henderson, our pathologist, for their aid.

*Since this paper has been read 17 more threatened abortions have been delivered. All the babies were normal. One hundred and thirty-seven pregnant women are taking stilbestrol at present. No fetal abnormalities have been observed in any of these babies who have been carried to term with stilbestrol.

*Stilbestrol crystals supplied through the courtesy of Ortho Products, Inc., Linden, New Jersey; tablets by E. R. Squibb & Company, New Brunswick, New Jersey, and Parke, Davis & Co., Detroit, Michigan.

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326 Medical Arts Building

DISCUSSION (*Abstract*)

Dr. Willard M. Allen, St. Louis, Mo.—The factors controlling the onset of labor have been discussed at considerable length by numerous people from time to time. One of the best ideas is that proposed about 1880, which states that some "are inclined to attribute the onset of labor at the usual time to the fact that nature, after ages of experiment, has found the end of the tenth month to be the most suitable time. For when labor occurs at a much later period it is usually very difficult and results in dead children, while at any earlier period puny children are born which usually perish soon after birth."

Dr. Karnaky has said that he was taught that the increased irritability of the uterus, found at parturition, occurs because of the gradually rising estrogen level. This concept doubtless arose because of three observed facts: (1) The amount of estrogen excreted in the urine of women during normal pregnancy, increases as pregnancy progresses. (2) The uterus of the castrated rabbit is sensitized by the administration of estrogen so that it responds to extremely small amounts of pituitrin. (3) The uterus of the rabbit becomes sensitized to pituitrin as term approaches. One could probably assume, as Robson did, that parturition in the rabbit is probably due to the increasing level of estrogen. This conclusion, logical as it appears, is, however, not apparently correct even for the rabbit.

The administration of estrogen beginning a few days before the expected onset of labor, not only fails to induce premature delivery but actually prevents parturition so long as the estrogen is given. This inhibitory effect of estrogen is due to its effect on the survival of the corpora lutea because, if the ovaries are removed, the animals promptly abort despite the estrogen. The estrogen causes the corpora to continue to produce progesterone, the progesterone actually preventing parturition. It is also known in the rabbit that the administration of estrogen prolongs the functional life of the corpora lutea, even in the absence of pregnancy. All of the experimental work that is available, therefore, for the rabbit, indicates that the corpora lutea do not regress when the estrogen level is high. Or, to put it in another way, the functional activity of the corpora lutea and their ability to produce progesterone are dependent upon the presence of an adequate amount of estrogen.

Study of the effect of the two sex hormones, estrogen and progesterone, on the uterine muscle of castrated rabbits has also shown that the *in vitro* response to pituitrin depends not only on the particular hormone used but also upon the particular combination of hormones used. If estrogen only is given, the uterus is markedly sensitized and if progesterone only is given the uterus is desensitized. If, however, the uterus has been under the influence of both estrogen and progesterone, the muscle is not only desensitized but actually the administration of pituitrin results in complete inhibition of all spontaneous contractions, whereas when progesterone only is administered the uterus simply fails to show any response to pituitrin, the spontaneous contractions continuing.

I have cited these experiments made in the rabbit because Dr. Karnaky's observations are entirely in accord with what one might expect, the only difference being that, in the rabbit, estrogen promptly kills the fetuses, although it still prevents parturition, whereas in the woman, estrogen, even in large doses, apparently has no effect on the fetus.

I am also especially interested in Dr. Karnaky's observations that stilbestrol injected into the anterior lip of the cervix results in prompt cessation of uterine contractions. We know that estrogen produces its effect when applied locally. Estrogen suppositories are very effective in producing growth changes in the vaginal epithelium even though the amount may be insufficient to produce any systemic effects. Also the application of estrogen to the skin overlying the breast results in the growth of that breast and not of the other. A small crystal of estrone in the anterior chamber of the eye produces growth of an endometrial implant in that eye without markedly affecting the uterus. It is quite apparent from this that estrogens have their characteristic effects on the end-organ because the estrogen has actually arrived at the end-organ. Hence one would expect more prompt effect upon the uterine muscle if the estrogen could be applied to the uterus, and I presume the "short" interval between injection and result when stilbestrol is injected into the anterior lip is due to the rapidity with which large amounts of estrogen arrive in the uterine muscle. In this connection I should like to ask Dr. Karnaky if the estrogen is injected directly into the cervix or if it is injected just anterior to the cervix, between the bladder and the cervix proper. If it were injected between the cervix and the bladder one would expect that there would be very little difficulty in injecting a considerable quantity, whereas if it were injected into the anterior lip one would expect to find some difficulty in injecting more than a few cubic centimeters.

I think it might also be worth mentioning that the injection of oily solutions in highly vascular areas is associated with some danger since oil embolism could readily occur if a vein were inadvertently injected.

In conclusion, I should like to congratulate Dr. Karnaky upon carrying out an experiment which is perhaps contrary to the supposed logic but which is, nevertheless, based upon sound physiology. Of course, it would take a considerable period of time to determine whether the estrogen is truly beneficial in threatened abortion. We all know that many patients abort one or two times and then carry normal pregnancies to term, and we all know that many threatened abortions do not result in abortion even though nothing specific is done for the condition. We also know that many abortions are inevitable and result in delivery of the products of conception, no matter what is done. One

must have caution in concluding that any form of therapy is truly beneficial. The use of stilbestrol as shown by Dr. Karnaky, is certainly as promising as any of the other methods of endocrine therapy which have been proposed and in addition has the merit of being moderately inexpensive.

Dr. Frederick V. Emmert, St. Louis, Mo.—The new estrogen-like drug, stilbestrol, has substantially enriched our armament for prevention of habitual abortion and premature labor. In some of his cases, Dr. Karnaky has administered tremendous doses of the drug and he claims that no ill effects on mothers or babies were observed.

Estrogenic substances for treatment of hyperemesis gravidarum and of threatened abortion were tried about fifteen years ago, when injections of "ovoglandol" were given for this purpose. The therapeutic effects at that time proved not too encouraging.

I am astonished to learn that oral administration of massive doses of stilbestrol by Dr. Karnaky were well tolerated. This is in contrast with the observations of others that stilbestrol causes nausea and vomiting in non-pregnant cases. Dr. Karnaky's finding that stilbestrol will prevent morning sickness will be indeed welcome news to the majority of pregnant women.

It would be very interesting to investigate the modus of the strikingly rapid action of stilbestrol after injection into the anterior lip of the cervix. Inasmuch as the drug is dissolved in an oily vehicle, one would expect a slow onset of action and a long duration. Could it be that the deposition of the drug near the ganglion of Frankenhaeusser has some bearing on its rapid action?

Dr. Karnaky, in some of his cases, has examined the naval cords and placentae for possible damage due to the use of stilbestrol. It would be very interesting to study the effect of very high doses on the basophil cells of the anterior pituitary gland and on the function of the milk glands.

The high cost of potent progestin preparations prohibits their use in many instances. Medication with stilbestrol is very economical and thus benefits the masses.

If Dr. Karnaky's deductions are confirmed by further investigations, his experiments will have opened a new and promising field for therapeutic effort.

Dr. William Bickers, Richmond, Va.—We speak of threatened abortion as if it actually were an endocrine disease. It may be, but I do not think there is sufficient evidence yet to draw that conclusion. Uterine contractions in threatened abortion and in dysmenorrhea have interested me, so about a year or so ago I began to study the contractions of the human uterus *in situ* by the use of intra-uterine balloons connected to a mechanical recorder which gave a graphic recording of the contractions on a revolving kymograph.

Starting out with the study of dysmenorrhea we found that first the contractions in dysmenorrhea are high in nature. They are the typical corpus luteum type of contractions. Effort to inhibit these contractions with progesterone in any dose failed. I have had the opportunity on three patients thus far, in whom it was desired to induce therapeutic abortion, to place the balloon in the uteri and get a graphic tracing of their contractions. It was impossible with progesterone in doses as high as 150 milligrams to show graphically any change in uterine contractions. I have never been able to show any effect of progesterone on uterine contractions either in the gravid or the non gravid uterus. The natural estrogens which I have used change the pattern of uterine motility only when given in sufficient dosage to inhibit ovulation or, more accurately, when it is given in sufficient dosage so that the typical secretory phase of the endometrium does not appear.

I have made tracings of the contractions of a young woman who was menstruating and suffering from dysmenorrhea. The contractions are high in amplitude, characteristic of corpus luteum influence. In her May menses she received 200,000 units of "amniotin" in the first half of her cycle, and this is a very small dose to prevent or suppress ovulation. In only a very small percentage of patients can you suppress ovulation with any dose of estrogen. This happened to be one, and one of the very few, that I have ever seen in which it could be done, and the change in the contractions was demonstrated. The estrogen-type of contractions are low in amplitude, as contrasted with the corpus luteum or progesterone type of contractions.

A tracing after 30 milligrams of "proluton" is like the first one. There is no change. After 100 milligrams of "oreton," there was no change in the uterine contractions.

So we have a very dim spark of evidence to support Dr. Karnaky's conclusion, I think. It may be that with large doses of stilbestrol we can change the high amplitude contraction to this low amplitude type. I hope that it is true, but I doubt it, for the reason that I have found it impossible to change the pattern of contractions in threatened abortion and in labor by any hormones other than posterior pituitary.

Dr. Karnaky (closing).—Dr. Allen mentioned the possibility of occurrence of oil emboli in cases where stilbestrol is given into the anterior wall of the cervix. We have given about 4,000 cervical injections and so far we have had no infection or emboli. It is apparently safe. Dr. Emmert suggests that the results which are quickly obtained may be due to a stimulation of Auerbach plexuses in the cervix. I thought they might be due to nerve stimulation but not a stimulation of the Auerbach plexus.

Dr. Hamblen in an earlier paper on sterility said that 25 per cent of these cases aborted. This was our experience until we began to use stilbestrol. We start them on 5.0 mg. of stilbestrol every night for 6 or 7 months. If they begin to have severe uterine pain I tell them to take 5, 5.0 mg. tablets every 15 to 30 minutes until the pains are gone. Then 2, 5.0 mg. tablets every hour for 6 doses and then 1, 5.0 mg. tablet every hour for 6 doses. If the pain is severe 25.0 mg. of stilbestrol is given into the anterior wall of the cervix using a spinal needle and a 10 c. c. syringe.

Dr. Emmert mentioned our microscopic studies of sections of the placenta, cord and membranes. We found no abnormal changes. According to the graphs shown by Dr. Bickers, it appeared that in cases of abortion there is too much corpus luteum.

The effects of stilbestrol on the baby, mother and the deliveries were of interest. In some of the children the areolar area of the breast became dark in color. This also occurred in the mother. The actual deliv-

eries were much smoother than normal. The uterus seemed to contract more evenly and smoothly.

In all the cases the actual blood loss was much less than normal as measured by our crude method. Blood loss was from 75 to 100 c. c. in stilbestrol cases. This we studied especially. We have lessened the blood loss and believe stilbestrol will be used as a routine in all obstetrical cases. We know that a woman becomes a relative castrate soon after delivery so the estrogen helps her. Stilbestrol helped us to eliminate postpartum bleeding in some of our cases (50 cases).

THE INTERDEPENDENCE OF SCIENTIFIC RESEARCH AND OBSTETRICAL PRACTICE*

By GEORGE R. OSBORN, M.D.
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It is at once obvious that the discussion of this subject cannot lead to any other conclusion than that study and experience are interdependent and equally important in any line of endeavor.

We have seen obstetrics in the past twenty years ascend to a position of dignity and importance equal with medicine and surgery, and it is today one of the honored triad of which scientific medicine is composed.

Within the memory of most of us practicing medicine today the surgeon and the internist looked with condescension upon the obstetrician if they saw him at all, and yet, from the standpoint of service to humanity conscientiously and intelligently rendered his contribution to scientific medicine has been equally valuable.

Mankind or humanity en masse cannot think fast and new ideas and concepts evolve very slowly. It is paradoxical that through the ages, man, who can think and reason, has a primitive instinct to procreate which has impelled him to reproduce himself by the same physiologic process, generation after generation, and yet the medical profession knows comparatively little about obstetrics and the laymen practically nothing.

No scientist, no physiologist, no midwife nor obstetrician has ever discovered a scientific law or principle governing the process of reproduction that has not been in operation since the beginning of time.

Chromosomes have transmitted heredity, zygotes determined sex and hormones activated organs and coordinated their functions since Eve partook of the forbidden fruit and for her indiscretion was compelled to suffer labor pains. In this day which appears to be the dawn of a glorious age for obstetrics, let us not be presumptious because of the scientific knowledge which we have so recently acquired. May we not be like Mark Twain who said that when he was 18 years old he was appalled at his father's ignorance, but at twenty-five years of age he was astounded by how much the "old man" had learned in seven years. This humorous philosophy emphasizes the value of experience, and unlike factual knowledge it cannot be transmitted from one to another.

We cannot have a true and complete concept of anything nor any idea until it has been experienced, so let us give honor to Oliver Wendell Holmes and Semmelweis who combined their experience with rational investigation and gained a concept of obstetrics so great that only a few of their fellow practitioners could comprehend.

If we go back to the dawn of civilization many other individuals stand out in the history of medicine, yet until about the middle of the Nineteenth Century obstetrics received little consideration from the medical profession. Even the word obstetrics and obstetrician, its companion word, derived from the Greek prefix "ob," meaning before, and the latin verb "stare," meaning to stand, when interpreted literally signifies "to stand before" and suggests that neither the donor of the title nor the practitioners who accepted it, had a very high concept of the subject and professional dignity that it should come to carry. At this point I am constrained to say, at the risk of being charged with disloyalty, that the terms "obstetrics and obstetrician" should be dropped, if and when some terms could be found that would be understandable and pronounceable by some of the laity and all of the medical profession. By no power of imagination nor intelligent research, and less in the light of modern scientific medicine can there be found any reason or justification for the terms obstetrics and obstetrician because they express no meaning nor relationship to the division of scientific medicine which pertains to the study and care of the process of human reproduction. Lest this suggestion of changing a term, that so long ago found a place in the nomenclature of scientific medicine may seem trival, let me say that scientific medicine is universal and translatable, so to the devotees of scientific medicine the term obstetrics is an idiom, which when translated

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literally in any other language means nothing that pertains to the process of childbearing.

Midwifery and parturition express an idea, but have become obsolete because they do not encompass the concept of modern scientific obstetrics as a whole. Such a concept includes anatomy, physiology and pathology of the human female during the entire childbearing period. Such a concept envelops gynecology and if we go back again into the history of medicine we learn that Soranus of Ephesus who lived and practiced in the second century A.D., wrote a worthwhile treatise on midwifery and diseases of women that was the forerunner of treatises on gynecology published in Switzerland and entitled "Gynaecia".[1] This encyclopedia was the first collective or cooperative effort of medical writers after the dark ages, and showed a disposition on the part of these writers to apply rational thinking to practical experience, although it is said that much of what was purported to be new in it, such as the obstetrical chair and internal podalic version, has been found to have been described by Soranus more than fifteen hundred years before.

From what little I have learned of Soranus of Ephesus I picture him as a general practitioner who did obstetrics, not because he had to do it in order to maintain his hold upon his families, but because he appreciated its importance to society. His writings show that he was a student of social problems and that even in his day birth control was one of them, for I recall reading some years ago in a paper on the history of birth control the statement that he had in his armamentarium every contraceptive that is known or used today except vulcanized rubber.

So I can only marvel at what a chance for development obstetrics would have had if Soranus with his practical experience and rational thinking could have been associated with research men with some little knowledge of physiology and pathology, for the breadth of his concept might have inspired other physicians in sufficient number and with influence to raise midwifery to the dignity of a profession.

However, there was at that time no school of applied sciences, and outside of Ephesus it is doubtful that Soranus was very well known, although medical history proves him to have been a great man and could he have lived in this day he would rank high in the councils of scientific medicine. What an influence he could exert in correcting misconceptions and misnomers that have fastened themselves upon medical practice both through tradition and the lapses of progress and learning throughout the centuries.

Were he here now I think I hear him saying: "As I go about among you I am fascinated by your great institutions of learning, your wonderfully efficient and various means of communication and transportation; by the fact that the masses of your people are enlightened, and seem to be free to converse with the intelligentsia. It is more glorious than I ever dreamed in my day, yet it is with humble pride that I recall that in my day there were great chemists, astronomers, architects and philosophers and that you give credit to them for some of your heritage. As I speak to this scientific assembly I am not a little chagrined that I failed to get over to you my idea of making child bearing the prime feature of gynecology, or gynaecia. Had it not been for our getting mixed up with those Romans or Latins I don't believe you would ever have heard the word obstetrics, for their conception did not attribute to midwifery any of the scientific nor professional qualifications of a physician. There were few specialists in my time, else it would have seemed logical to me that one versed in gynaecia and practicing it should have been called a gynecian. However, I am pleased to learn that in your class A medical schools and hospitals you have obstetrics and gynecology under one head. Yet in a practical and ultra scientific age with your streamlining of everything it seems inconsistent that you retain obstetrics and obstretrician in your medical nomenclature. Thinking perhaps that it was sentiment respecting the horse and buggy days I have looked into some of your automobiles and trucks expecting to find a whip socket, but no! it has gone with the dashboard. So I'm still perplexed, but not unhappy, for I have today seen what I would call gynecians practicing gynesia as I conceived it so long ago."

We have attained, through scientific research, a greater knowledge of medicine than in any period recorded in the history of man, but we cannot say greater than in the existence of man, for history does record many ups and downs in civilization and some things that we have learned from the down periods have been the most durable in the evolution of civilized man. There is the life of a biological freak called an axolotyl. It is a larval salamander or polywog found high in the mountain lakes of Mexico and Western United States. It lives and breeds year after year or indefinitely, but if taken to lowland lakes it loses its gills, develops legs and becomes an adult salamander. Formerly it was classified by

biologists as a distinct genus and called a siredon. Then a few years ago a physiologist fed the axolotyl some thyroid hormone and it soon became a salamander, showing that its progenitors were of a particularly agile tribe of salamanders that had been able to leave the lowlands and make excursions into the highlands, and gradually came to live apart from the lowlanders. And thus it came about that they lost their legs and became axolotyls because the over development of the propensity to climb carried them out of contact with the basic element or growth hormone that had transformed their fins into legs.

Hence as we stand today upon the high ground of modern scientific obstetrics, unless we appreciate the analogy between the evolution of the salamander and the development of midwifery to obstetrics or, what I would prefer to call gynecia, we, as practitioners, may revert to obstetricians or even midwives. However, it is reassuring to the practical obstetrician whether he be a specialist or general practitioner, and possibly confused by the many new scientific facts discovered and theories advanced, to see that in all good research laboratories the obstetrical practitioner is on an equal footing with the physiologist, pathologist or chemist. In fact he is the director who propounds the problems, and evaluates their solution. From obstetrical practice is emitted the hormone that activates and controls the research organ.

It is axiomatic that the more one learns about any subject the greater becomes his interest in it, and the more proficient one becomes in any line of endeavor, the more pleasure he will gain from it; so scientific research is making obstetrics a fascinating practice and a field of medicine that is producing many problems that will require intensive study and profound judgment to solve.

One of these is the inter-relationship of fetal and maternal physiology. No longer can we think of the fetus as a parasitic organism, for immediately upon the inception of pregnancy new and increased physiologic processes begin in the mother and the time lock upon the flood gates of menstruation fails to open. No new hormone from the embryo is known, yet some exciting factor emanates from it that stimulates immediate activity in all endocrine bodies of the maternal organism, and brings into control an Office of Production Management that is a marvel of dispatch and efficiency.

At the point of contact of the fertilized ovum newly differentiated deciduo-placental tissue, peculiar to the process of reproduction, develops. Its function has long been known but only in the last few years has its complex physiology been realized so that it is now one of the most interesting subjects undergoing scientific investigation, and it is notable that the most recent research work that has come to my attention indicates that the cause of the late toxemias of pregnancy,[2] whenever discovered will be found to be a conflict in the inter-relationship of the maternal and fetal endocrines as they involve the metabolic process of the fetus, and as has long been suspected, the placenta, which is the transfer depot between the fetal and maternal organisms.

These investigations are revealing facts regarding physiology, embryology and endocrinology that the practitioner of obstetrics must know and apply in his prenatal care of his patients or be held morally responsible for the late toxemias of pregnancy and for the defects in the newborn, as well as for deficiencies developing later in children that he delivers. In this connection it is interesting to note that it has been shown that cholesterol is not transmitted from the mother through the placenta to the fetus[3] but is produced in the fetus itself in direct proportions as the cholesterol in the mother's blood. Clinically this hypercholesteremia accompanies hypothyroidism and a low basal metabolic rate, and hypothyroid mothers are prone to have larger or fatter babies, and it is now believed that hypothyroidism developing later in life is often of congenital origin.

Anesthesia used in labor is another subject under investigation both scientifically and by the cut and try method. Its study requires the closest cooperation between the scientist and obstetrician because as yet no method of relieving labor pains without some effect upon the course of labor or possible effect upon the child has been found.

Although in the past twenty years an immense amount of research has been done to solve the problem of endocrinology and metabolism as applied to the physiologic processes of reproduction, the practitioner who tries to make a practical application of his new found knowledge finds himself in wonderland. He has a tremendous responsibility in that he must evaluate it. If he be philosophical, he will ask: How does the growth hormone, abundant in the circulation of pregnant woman, stimulate growth in the fetus while the woman does not grow in stature. What causes labor pains to begin? Does this signal come from the fetus or from the mother?

Why does a tuberculous woman when she becomes pregnant apparently take on new life and even in some cases where the disease is in an advanced stage, give birth to a healthy, well developed infant?

In abruptio placentae, what disaffection between the maternal and fetal physiology can, like an explosion, separate the placenta, burst the uterine blood vessels and tear asunder muscle fibers in the musculature of the uterus?

These are some of the questions that in the light of the results of clinical and experimental research now going on may soon be solved, and when they are, others will present themselves so there is no end to obstetrics nor are there dull moments for its clinical devotees providing they have the concept of a true gynecian.

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DISCUSSION (*Abstract*)

Dr. Warren E. Massey, Dallas, Tex.—If we are to stand before this woman who is going to reproduce herself, then we are in the position of a guard who is to run interference for her while she is in the process of satisfactorily producing a new life. The position of being a guard in every sense of the word is no little responsibility.

An obstetrician must be competent in the many different branches of medicine which converge upon the process of reproduction.

Dr. Richard Paddock, St. Louis, Mo.—Dr. J. Whitridge Williams used to recall to mind that a certain well-known obstetrician always used the word "accoucheur" in his writings and he referred to himself as an accoucheur. Dr. Williams rather reveled in the term "obstetrician," because he said an accoucheur was a man who put women to bed. He felt that "obstetrician" was a little more dignified term than that one.

The programs of our meetings exemplify today a number of things that were brought out in this paper: for example, the work on autopsy findings in eclampsia, the paper of Dr. Kooser, particularly in regard to the diet of the pregnant woman and the development of transfusion technic in rural districts, as well as many other procedures that we more or less take for granted at the present time. The paper that follows this one, the work on vitamin K, by Dr. Hellman, will exemplify these very things that Dr. Osborn has brought out.

Dr. Osborn (closing).—The term "to stand before" came from one of the attitudes that women used to assume when they were in labor and the midwife stood before them and they leaned on her while they were having their labor pains. It had no scientific basis for its origin.

AFFECTIVITY*

By WALKER THOMPSON, M.D.
New Orleans, Louisiana

By the term affectivity I have reference to feelings; feelings which result in diffuse activity of the organism. By this definition, sensations resulting in isolated reflexes, for example, are excluded. Affective feelings are the result of sensations, past, present, or anticipated, including memories, thoughts and ideas. When the feeling or affect persists, it is called a mood. The terms "belief" and "sentiment"[10] may be included as special types of affectivity because their strength depends upon how much feeling they carry. Emotions are associated with affectivity because strong feelings result in emotional motor expression. In fact, emotion is often used synonymously with affect, yet the word emotion connotes motor activity and could be used largely in that sense.

The universal prominence of affectivity in medicine establishes its importance, for disease means discomfort, that is, disturbed feelings or affects. Affectivity is not limited to disease by any means for it largely directs all our activity, whether it consists of feelings of hunger, hope, or exhaustion. Bleuler[2] says that affectivity determines one's actions and is the decisive element in decisions. He says:

> The character of a person is almost exclusively determined by affectivity. It determines the direction and force of action, and through its endurance and irradiation, as well as through its influence on the logical functions, it provides uniformity and emphasis for this action.

Any individual, layman or physician, recognizes the importance of his own feelings and yet being so obvious, affectivity is often overlooked and being ever present, it is hard to capture. And it is not just enough to know only the source of a disordered affect to treat it, any more than finding the tubercle bacillus is enough to heal tuberculosis. Affectivity must have some inherent characteristics important in themselves which should be better known.

From the definition it is seen that affects can and do diffuse in a widespread fashion, may diffuse into consciousness. Although strong affects would be expected to reach our field of attention, they may be walled off because they are too

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strong to contemplate, and in situations of extreme danger, we may react correctly and efficiently without recognizing the feelings of fear until after the danger is gone. Mild affects may be acted upon without giving them any attention, usually because there are other components of the situation with more affective interest or importance. Whether or not we recognize our feelings, however, they tend to express themselves in some sort of appropriate reaction. Especially the more primitive reactions are not to be denied if the affect is of any strength. In certain schizophrenics there does appear to be a blocking mechanism, but even here distorted and exaggerated autonomic manifestations can be observed, such as dilated pupils and cyanotic hands.

It is true that many affects are so conducive to normal physiology that their diffuse actions on the viscera are not commonly remarked upon. Also mild degrees of affect surely can be experienced without evident emotion, but mild affects repeatedly experienced do build up to such a strength that an outbreak is inevitable.

Cameron interpreted[3] Whitehorn's blood sugar studies in a large group of depressions as indicating that a strong depressive affect does not necessarily result in an emotional reaction.

To repeat, then, an affect is a composite of sensations which is potentially diffusible as a regulator of widespread activity, not necessarily conscious, nor always expressed.

I believe that affects of a most fundamental character arise from the instinctive need to keep the organism alive. They form a constant background for all other feelings which may come and go on the scene. Whether we are hungry or not, the urge to get food or its equivalent, property, is ever acting. Whether or not we are in danger, we are constantly on guard to avoid it, or we are constantly looking for security. The sexual instinct is a powerful force for the propagation of the race, and it is also in the background to influence our activities. In the sexual instinct there is a very strong element of seeking security, which makes it of great importance to the individual himself. According to Karen Horney[6] the need for security more than sexuality is the important need which must be satisfied. I believe that all these "instincts" might be grouped under the heading of need for security.

But there is something more: the instinct for freedom and spontaneity.

Man's ills are influenced to a large extent by concern for his security, but freedom and spontaneity are positive factors not to be underestimated. Meyer[16] says that:

> It is a strange thing that so much emphasis is put on what is wrong and that there is such a lack of interest in the positive facts of life as found.

Spontaneity, according to Meyer, is:

> That which the person may be expected to rise to and to rise with on his own. . . . The fundamental sense I imply in spontaneity is one of naturalness.

Security is a static feeling and cannot alone lead to spontaneity without the recognition of a more dynamic feeling of being alive and potentially useful.

Working out of, with, and against these fundamental feelings are the many other specific feeling tones, some of which have been studied more in detail than others. Clinical psychiatry is rather familiar with anxiety, despondency, elation, suspiciousness, and anger, which seem to produce more obvious and extraordinary manifestations. Yet the less dramatic feelings of boredom, uncertainty, lonesomeness, anticipation, complacency and self-satisfaction are very frequent and also can be out of place and pathologic. The mood of loneliness can persist when there seems to be no adequate cause for it. A man may, to his ruin, persist in following a feeling of complacency which is entirely out of keeping with the real situation. The explanation for this may be obvious or hidden, but that does not detract from the importance of the mood's influence. The miserly old lady who lives like a pauper, although she has thousands of dollars hidden away, perhaps is compensating for a misspent past, but nevertheless, she acts with the feeling, pathologic to be sure, of insecurity. Perhaps any feeling or mood can occur in degree and duration which in itself is responsible for pathologic thinking and acting. I wish to emphasize the words "in itself responsible."

The numerous ways in which affects or affective tendencies develop have been analyzed in many individual cases. Immediate situations, previous and forgotten experiences,[5] sensations to which the person has been conditioned,[8] constitutional endowment, among others, are factors which have been worked out in detail elsewhere.

It should be noted that the same sensation or situation can lead to entirely dissimilar affects. The appointment to a position of responsibility may produce a feeling of unhampered freedom for expression, or it may represent loss of security and ease. The same melody brings up

associations of disgust in one individual and pleasure in another. Loss of a parent will bring to the fore a great variety of feelings and mixed feelings. Where ambivalent feelings occur which are completely incompatible, such as pleasure and guilt, the whole personality will be disorganized by the attempts of the affects to overthrow one or the other. If there is a struggle with one affect finally emerging victor, it will have reinforced itself to such a degree that it overwhelms the personality, possibly in psychotic degree.

Three months ago one of our women patients, 26 years old, lost her older sister, who had always taken the responsibility of the household and also the prestige and rewards, which the patient envied. The death shook the whole pattern of the patient's life and she struggled between accepting her sister's place of prestige with the responsibility for which she was unprepared or yielding to grief for her loss of security. The urge for prestige and freedom expressed itself a few weeks later in a state of pathologic euphoria and excitement with an exaggerated abandon and devil-may-care attitude. Guilt feelings, still undissipated, as well as loss of security were the strong repressed affective factors which necessitated the redoubling of the feeling of power and euphoria.

Another patient, a woman of 38, lost her mother, and, having always been emotionally dependent on the mother, she felt the loss keenly and grieved deeply until, as she said, something snapped and all her feelings left her. Since then she has been in a dream state hallucinating her mother as in a white cloud, and evidencing rather catatonic behavior. What the complicating affects were is not known, but there probably was additional cause for such an extreme reaction. The affectivity could not be borne by the personality and was finally denied as existing. With it reality and personal insecurity were denied, and she found freedom in an autistic world.

A man of 45, who has always been a rather high-strung, tense individual, came to the hospital complaining that his legs trembled when he stood up for any period of time or when he worked, but stopped when he walked down the street. There were no neurologic signs except this particular tremor which was rather a tension tremor (not "intention tremor"). Such a tremor is frequently to be seen in the normal in certain extreme situations of tension. Cameron[3] has termed tension "a state of psychobiological preparedness," which in moderate degrees is quite normal. In this man the tremor came on at the time his sister died a month before. He denied any grief, anxiety, or worry either in relation to this death or to anything else. "I have nothing to worry me, doctor." Yet he admitted readily enough that her death did make him think of his own eventual death and that at her house he had to go to bed because his knees shook so.

Here we see the more or less successful transformation of an affect into a form more suitable or more palatable to the personality. The painful diffuse affect was dissociated into isolated, less disorganizing symptoms. It is interesting that here it took the form of exaggerated tension. He overcompensated his need for "a state of psychobiological preparedness."

In the classical depression we may find, if we look closely, that the affect or mood has been largely transformed into mood equivalents, physiological symptoms, which are appropriate to the mood and which relieve the personality of some of the strain although at the same time promoting a vicious circle. Such cases may go into a depressive stupor of years' duration. The more labile and mixed depressions put up a harder fight and get out of their mood by rapid improvement or suicide.

What inherent characteristics of the mood and affect should we note as particularly striking? In the first place, periodicity stands out in the normal as well as in the abnormal; cyclic reoccurrence is well known. We associate the cycloid personality with the manic-depressive psychosis. Bleuler[2] finds the psychopath to be more correctly a thymopath, who is apt to express his whims without emotional restraint at intervals, between which he can be pleasant and agreeable. In the "affective psychoses," schizophrenia and hypochondriasis there can be seen this periodicity, quite apart from precipitating causes. Even in the normal it would appear that time works as surely in building up affective unrest as it does in dissipating it. We do not allow even our most constructive feelings to be sustained without intervals of respite. Other affects find expression with the provocation of the menstrual cycle. Possibly some analogy with the periodic building up of electrical potentials in epilepsy might be speculated upon.

The tendency of an affect to reinforce itself and to spread is another characteristic given by Bleuler.[2] Not only does it spread throughout the activity of the organism, but in point of time an affect generally outlasts the situation producing it.[2] This is in part due to the rein-

forcing action mentioned above and to the tendency to procrastinate the necessary adjustment to the difficult affective situation. Another characteristic, noted in one of the cases, is the manner in which mood will strengthen itself to outdo other strong, incompatible feelings. To reinforce itself, the mood puts its color onto the significance and even the actual appearance of all incoming perceptions, and memories may be actually falsified to fit the mood.

The contagiousness of moods is easily appreciated even by a beginning student of human nature, particularly when the mood is freely expressed. Even in the schizophrenic where the affect is expressed with distortion, the queer feelings, the puzzlement and bewilderment can be felt by the observer. Feelings of unrest, resentment and suspiciousness in one member of a family do not exist long without other members of the household experiencing the same feelings. Feelings of contentment and security in the mother are carried over to the child in an almost mysterious manner. Feeling of willingness to do, *esprit de corps,* hate, anger, resentment, and fear can spread quickly and with tremendous force whenever large numbers of people are collected together, "all in the same boat," with common interests. Whether the group is a disorganized mob or a well disciplined army, they are the easy prey to the virus of strong emotion. Popular feelings and tastes have a way of coming and going without anyone's knowing the source, like a ripple over the land or a tidal wave. Music, the universal language, is the language of the most primitive emotions and of the most cultivated feelings. Catchy, rhythmic and martial music can fairly infect a whole nation with the fire and vigor of its mood.

One word about the emotional expression of the mood: we have noticed that emotional reactions are apt to be brief and more labile than the mood. They may serve as a means of struggle and release from the affectivity, but more often they are ineffective and merely augment the affect and discourage further action. Violent emotional outbursts, even if happy solutions to the immediate situation, are evidences of emotional immaturity and show that no other more constructive activity has been developed.

In summary, I would mention again the universal power of the affect, the occurrence of many moods of pathological and psychotic proportions besides those recognized in the strictly "affective psychoses," and finally the common observance of certain inherent qualities of affectivity which make the moods important in their own right, exclusive of their remote or recent origin.

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DISCUSSION (*Abstract*)

Dr. William Orr, Jr., Nashville, Tenn.—There can be no doubt that a better appreciation of the moods and feeling of patients would help us give more understanding therapy; yet when we talk of moods and affects we become lost in words. What one person calls an affect another calls an emotion. We equate patients' emotional display with our own subjective feelings without realizing that we are talking about two different entities.

I have attempted to devise a scheme representing the hierarchy of things felt, arranging them as if a reflex, that is, from stimulus to response. Take the sensation, discomfort. If acted upon actively by the personality the affect is abhorrence. The emotion is hate. The aspect of this hate is rage, and the response is fight. Passive discomfort becomes anxiety; anxiety fear. Fear is an emotion the aspect of which is cringing and the response of which is retreat.

I suppose that much the same treatment could be given other sensations with possibly interesting results,

but what should be emphasized is that no matter the viewpoint, the topic of affectivity is one of much theoretical and practical importance.

Dr. Archie D. Carr, St. Louis, Mo.—Affectivity influences gestures, speech, attitude and visceral and hormonal activity. As physicians we are apt to think of affectivity and other psychical reactions or states as occurring only in disease and by so limiting our thinking and philosophy we are apt to miss its significance in the pure process of "being." Since affectivity although always present, is hard to capture, and although we search for it and describe it, we really know very little as to its original source or how to handle it. It is apparent that it must have some inherent characteristics which are important in themselves and which we must constantly attempt to learn about. Dr. Thompson has quoted Bleuler in that "affectivity determines one's actions and is the decisive element in decisions."

Whether it is advisable to subdivide affectivity into various groups or subheadings as Dr. Thompson has with the term emotion, I do not know. He rightly points out that all affect does not rise to the level of awareness either due to its weakness or to its strength yet we react protectively under its influence. Aside from happiness and sadness it was pointed out that feeling tones such as anticipation, uncertainty, hope, boredom, anger, frustration, tiredness, lonesomeness, loss of opportunity and loss of security are types of affectivity which influence our behavior.

The importance of the possibility of the expression of affect very largely determines the pleasantness or unpleasantness caused us in our awareness of it. This awareness of any specific affect or group of affects must of necessity, in each of us, depend on the setting of the immediate situation, on past and forgotten experiences, previous conditioning, constitutional endowment and philosophy.

Dr. Thompson said "that affects of a most fundamental character arise from the instinctual need to keep the organism alive" and that "they form a constant background for all other feeling which may come and go on the scene." "These instinctual affects," he believes, "could well be grouped under the head of need for security; but that there was something more, the 'instinct for freedom and spontaneity.'" Meyer has also called our attention to this, that little attention is paid to the positive rather than the negative aspects of life.

It has properly been pointed out that, in psychiatry, we find widely varying reactions to specific affects. In many instances reactions occur which are illogical and destructive and frequently reactions for which there seems no adequate cause. Such reactions naturally disorganize the whole personality and sometimes completely overwhelm it.

Dr. Thompson (closing).—We should look for mechanisms that are common to all the disease entities as well as to the normal, and this one mechanism that I tried to apply over this large field was the mechanism of feeling. It is a very difficult subject to organize.

DIABETES MELLITUS AS A FACTOR IN INTRACTABLE ASTHMA*

By ALFRED M. GOLTMAN, M.D., F.A.C.P.
Memphis, Tennessee

During the past fifteen years occasional studies on the carbohydrate metabolism of allergic individuals have been reported. Ohler,[1] in 1923, reported the results of sugar tolerance tests on 14 asthmatics. He found the blood sugar levels abnormally low.

Ramirez, St. George and Moses,[2] in 1924, studied the blood sugar of 40 allergic individuals. They found that the blood sugar varied from 72 to 116 mg. per 100 c. c. of blood with one exception, which was 182 mg. This individual probably had an associated diabetic condition.

Malone,[3] in 1929, studied the blood sugar of 15 asthmatics and found it to vary between 68.9 and 80 mg. per 100 c. c. of blood.

Black,[4] in 1933, reported a series of 100 allergic individuals in whom blood sugar studies were made and came to the conclusion that more than half of the asthma and hay fever patients have fasting blood sugar values below the normal limit and that they have a definitely increased sugar tolerance.

Wilmer, Miller and Beardwood,[5] in 1935, after studying glucose tolerance curves on 100 allergic individuals, conclude that the sugar tolerance in allergic individuals is high.

It has been stated in the past that diabetes and asthma are rarely associated. Joslin recorded 6 cases in 1928 and since then has seen a good many more. He says that "allergy, tuberculosis and epilepsy are prone to occur in diabetes." Kerr has demonstrated that allergy may recur frequently in members of diabetic families. Swern,[8] in 1931, reported 6 asthmatics who developed diabetes. He noted that the asthma improved with the treatment of diabetes and that the skin reactions decreased with the onset of the diabetes. From the foregoing data we must assume that allergy and diabetes are associated much more frequently than we have formerly suspected.

I have studied the blood sugars of 100 allergic individuals and have done glucose tolerance tests on 65. These patients were not studied with the idea of determining the carbohydrate

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metabolism of the allergic, but because the allergic symptoms were not relieved or became aggravated in spite of allergic therapy and repeated checks on our allergic diagnosis. I fully realize the fallibility of allergic therapy, but feel that it is unjust to consider it a failure until thorough medical study of the individual has been completed in order to rule out complicating factors which may be present and which are foreign to the field of allergy.

Of these 100 selected cases 5 were proven to be diabetic as well as allergic. Ninety-five patients were non-diabetic yet definitely allergic. Forty-nine of these were thought to be purely allergic and without complications. These 49 patients were used to study the sugar tolerance of uncomplicated allergics. The average fasting blood sugar for the group was 78 mg. per 100 c. c. of blood. The lowest was 64 mg. and the highest 105 mg. per 100 c. c. of blood. Glucose tolerance tests were made using 100 grams of glucose. Specimens of venous blood were taken at intervals of one-half hour, one hour, 2 hours and 3 hours. The average rise at one hour was 116 mg. At 3 hours the blood sugar had fallen from 5 mg. to 10 mg. below the fasting blood sugar for each individual. These findings compare with those of Black and Wilmer and lead me to the conclusion that a great many individuals with uncomplicated allergic disease have at least a low normal fasting blood sugar and a very definitely increased sugar tolerance.

These 5 asthmatic patients who developed diabetes will be reported as a group rather than individually, because the essential facts in their histories and physical examinations are quite similar.

This group of patients consisted of 3 males and 2 females. All were of the white race and Hebrew faith. The ages varied from 55 to 72 years. The family histories were positive not only for allergic disease but for diabetes as well. Each one came to me for relief of frequent attacks of severe asthma which had persisted from 6 months to 4 years. Other manifestations of allergic disease had occurred earlier in life, namely: seasonal hay fever in 4 cases and eczema and urticaria in 1. All had had from one to three nasal or sinus operations but without relief. Epinephrine had been administered at frequent intervals over a period of months or years. Two patients said that after taking epinephrine they became very nervous, quite thirsty and urinated frequently. They had lost from 25 to 60 pounds in weight. This loss in weight began with the onset of severe asthma. Their treatment embraced all modern methods of allergic and medical therapy as well as some that were not so modern. In no instance had diabetes been suspected as a possible factor in the production of their severe asthmatic paroxysms.

The physical examinations of these patients revealed individuals of middle age or past who on the whole were decidedly emaciated. Their expressions were rather anxious and drawn as each one was suffering with rather severe asthma when first seen. The temperatures were normal. Average pulse rate was 96, regular in rhythm and of good volume. The eyelids around the palpebral fissures were reddened. The eyes seemed to sparkle and the conjunctivae appeared wet. The teeth were in good condition in three and two had false teeth. Tonsils had been removed in all. The chests were markedly emphysematous and were filled with whistling and piping rales with a very harsh respiratory murmur. Accurate physical examination of the heart was hampered by the emphysema and asthma present. However, we considered the hearts in good condition consistent with the strain they had been subjected to. Electrocardiograms were essentially negative except for left axial deviation in the 2 more elderly patients. The average blood pressure was systolic 150, diastolic 100. The abdomens showed no tenderness, rigidity or abnormal masses. The genitals were negative. Rectal examination showed hemorrhoids present in 3. The extremities in all appeared in good condition. Neurologic examination was negative.

X-ray of the chest showed the usual picture of asthma and emphysema. The sinuses showed a thickened mucous membrane throughout with some polyp formation in 2. Fluid or pus was not thought to be present.

LABORATORY EXAMINATIONS

Blood Count

Hemoglobin	100 - 110 (Sahli)
R. B. C.	5,200,000 (average)
W. B. C.	9,500 (average)
Eosinophilia	0 to 7 per cent

Stool examinations were negative. Urinalyses were made at 6-hour intervals for a 24-hour period. Four were negative for sugar, acetone and diacetic acid while one showed a 4 plus sugar in his afternoon and night specimens with a 4 plus acetone and diacetic acid.

Blood Chemistry

Calcium, 10 mg. per 100 c. c. of blood (average)
Cholesterol, 220 to 290 mg. per cent
Sugar (fasting), 168 mg. per 100 c. c. of blood (average)
Nonprotein nitrogen, 35 mg. per 100 c. c. of blood

The metabolic rates while done are purposely omitted because I consider them inaccurate as no gas metabolimeter was available.

Glucose Tolerance Tests.—The lowest fasting sugar was 142 mg. The highest 210 mg. The lowest rise at the end of 2 hours was to 285 mg. and the highest to 420 mg. The renal threshold for sugar was determined in conjunction with the tolerance test and the average threshold was found to be at 271 mg. The highest was 290 mg. The lowest 240 mg.

A complete routine allergic study was made and they were found to be sensitive to various allergens.

I now wish to discuss the salient features of this study with reference to the diagnosis and treatment of some patients, at least, who suffer with intractable asthma. The histories of these individuals are most interesting, in that they all had a familial as well as racial predisposition to diabetes. Whether or not they had diabetes or were only potential diabetics prior to the onset of their asthma, I do not know. We can say, however, that a predisposition to diabetes was present and that the palliative treatment which they had had for months or years, namely, epinephrine used at frequent intervals, may have aggravated an already existing diabetes or may have been a definite factor in making a potential diabetic a true diabetic.

The intractable asthma masked the clinical picture of diabetes and the physical signs previously enumerated were thought to be due to the prolonged asthma.

The first case of this group which I encountered proved most annoying and, to say the least, embarrassing, yet from this patient I learned my lesson and like the "burned child who fears the fire," I now suspect diabetes mellitus as a factor in the production of intractable asthma until it is definitely ruled out by blood sugar studies.

It has been shown that the fasting blood sugar in allergics is low and that their sugar tolerance is high, yet this study shows that when diabetes mellitus becomes associated with asthma the sugar tolerance of the allergic individual becomes greatly impaired. Instead of having a high sugar tolerance the patient develops a low tolerance for sugar. While the sugar tolerance of these patients was low still their renal threshold for sugar was quite high. The high renal threshold for sugar was thought to be on an arteriosclerotic basis. This fact with resulant negative urine findings in 4 patients was one reason why their diabetes remained undiagnosed until blood sugar studies had been made.

After the diagnosis of diabetes mellitus was established dietetic therapy with insulin was immediately begun, and injections of epinephrine reduced to a minimum or left off entirely. In the beginning of their dietary treatment all foods to which these patients were found sensitive were eliminated, but after a time they were added to the diet without any ill effect being noted. Desensitization with pollen extracts had been continued as well as elimination of allergens of the epithelial and inhalant groups. In spite of this strict allergic regimen if any one of these patients becomes indiscrete in regard to his or her diet and has a prolonged elevation of blood sugar, severe asthma begins. We have found that they remain practically free of asthma as long as their blood sugars remain within normal limits.

It is interesting to note that Wegierko,[9] in 1935, reported a patient with diabetes whose attacks of asthma seemed to improve following the administration of insulin. In order to test his hypothesis the patient was given insulin while in a fasting state and suffering from asthma.

The asthma subsided as the hypoglycemia appeared and the patient remained free of asthma for 2 months. Another group of 12 patients was given insulin to produce hypoglycemia. In all instances the asthmatic attacks subsided.

This work combined with my own studies and those of Black, Malone and Wilmer suggests to me that possibly there may be an increased adrenal secretion in the hypoglycemic state which tends to counteract allergic phenomena.

It has been suggested that not only hypertonic glucose solution be used but epinephrine as well. My observations warrant my repeating that such procedures are not without danger unless blood sugar studies have been completed on the patient prior to the institution of the treatment.

A ketogenic diet has been advocated by some for relief of bronchial asthma. Peshkin and Fineman[10] considered it as a form of nonspecific treatment and reported good results working

with children only. However, Alexander[11] found it of little or no value in adults. One of my patients with diabetes had a very decided acidosis, yet this seemed to have no beneficial effect so far as the patient's asthma was concerned. I must add that this therapeutic procedure is also attended with danger in the absence of prior blood sugar studies.

CONCLUSIONS

(1) Intractable asthma may mask the symptoms of an associated disease such as diabetes mellitus.

(2) Ordinary physical examination with a negative routine urinalysis does not eliminate diabetes as a possible associated disease.

(3) Diabetes is associated with allergy much more frequently than we formerly suspected.

(4) When diabetes is present in a severe asthmatic, the asthma is aggravated and prolonged until dietetic therapy is instituted.

(5) Competent allergic therapy often fails to afford relief to the severe asthmatic. In these instances diabetes should at least be suspected as a possible cause of the intractable asthma.

(6) While the sugar tolerance of the uncomplicated allergic is high, this tolerance is lost with the onset of diabetes.

(7) Any form of therapy which tends to elevate the blood sugar of, or produce acidosis in the severe asthmatic, may result in great harm to the individual unless diabetes is ruled out as a possible associated disease.

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DISCUSSION (*Abstract*)

Dr. J. Harvey Black, Dallas, Tex.—Low fasting blood sugars have been reported in many allergic individuals, and Dr. Goltman has used that as a predicate upon which to base some of his conclusions. I must remind him, of course, that there are other men who unfortunately are just as good observers as Wilmer and I, who have found just the opposite. For example, MacQuiddy and Rackemann and his co-workers, contend that in studies such as I made and Wilmer and his group made, they find no evidence of low fasting blood sugars in their allergic individuals.

I think the reason that we do not come to any agreement probably is that our group studied is too small. I reported on 100 patients and I think the other groups studied were probably no larger. The statistics involved were too small in number to be accurate or to show significant difference. At any rate, the question of whether we are dealing with low fasting blood sugars in the general run of allergic individuals is still open to question.

In a series, 5 per cent of allergics showed diabetes, which, if we should simply accept it in that form, would mean that the rate was very high. But this series represented 100 cases that were failures so far as allergic management was concerned. The reason you have not seen so many diabetics, of course, is the fact that you have not had a hundred failures, but some of us do, and Goltman has been brave enough to select a hundred failures and investigate them from other points of view and pick up five diabetics. Whether that is high in that group of patients, of course, I have no idea, and I suppose none of the rest of us has, because none of us probably has investigated it from that point of view. Personally, I had the feeling that diabetes was not nearly so common even in the patients who were unsuccessfully treated.

These patients went undiscovered possibly because urinalyses showed no sugar in the urine and blood chemistries were not done. These were elderly individuals with vascular disease as well as their diabetes and their allergy, all of them had a high renal threshold and except under unusual circumstances probably were putting little or no sugar out in the urine, so it was missed on the ordinary, cursory investigation, and only with the blood chemistry determinations picked up, which I think ought to be a lesson to all of us.

Two interesting implications, of course, are those he mentioned: one, the possibility that prolonged epinephrine administration might have a bearing in converting a potential diabetic into an actual diabetic; the other, the question of the possible beneficial effect of insulin as it affects the diabetic who also is allergic. Whether this beneficial influence comes simply in correcting the carbohydrate metabolism or whether it has some other effect upon the allergic mechanism certainly is an interesting thing to think about.

Dr. E. Rankin Denny, Tulsa, Okla.—In the one hundred allergic patients studied, Dr. Goltman found five diabetics suffering with asthma. They were all of the Hebrew faith. I do not know whether he means to imply that five per cent of the allergics have diabetes or not. Diabetes, according to Joslin, is two and a half times as frequent among Jews as in non-Jews. If this is true, then a lowered percentage of diabetes in all al-

lergics probably occurs than these statistics would indicate. In fact, in 1935, Koenig, in Europe, found three asthmatics in 1,240 diabetics. He found six diabetics in 4,000 asthmatics.

One other point to which I wish to call your attention is the marked variability of glucose tolerance tests in the same individual, which is largely influenced by restrictions of carbohydrates previous to the test. To my mind, that accounts for more of the discrepancies in glucose tolerance tests than any other one factor.

If one carries out a glucose tolerance test in a patient who has been on limited carbohydrate intake, a curve will result that approximates that seen in true diabetics. Therefore, it behooves us to ascertain this fact, and this is very important, that before doing glucose tolerance tests the patient must not have been vomiting, he must not have been having a diarrhea, he must not have been in such a prolonged asthmatic state that his intake of food has been of necessity markedly restricted, because a pseudo-diabetic curve will result.

For the past four years I have seldom done a glucose tolerance test without preparing my patient for it, and this preparatory diet consists of 80 grams of protein, 300 grams of carbohydrate, and 150 grams of fat. They take this diet for from three to five days before the test is run. If this plan is followed there will be no longer any argument about the glucose tolerance test's being a poor indication of the ability of the organism to metabolize carbohydrate.

I particularly refer to the work which Conn, of Ann Arbor, has been doing for many years, and in some isolated instances (and I do not mean to imply that these cases of Dr. Goltman's were not true diabetics), Dr. Conn has found several cases of so-called diabetes which were being treated for years as diabetics, in whom it was obvious that the original glucose tolerance test was done when the patient was in a poor state of nutrition. A starvation diet can give rise to marked hyperglycemia with glycosuria, but when the same patient is put on a preparatory diet for from three to five days, the glucose tolerance test was quite normal and subsequently those cases on a general diet maintained normal nutrition and felt well.

Dr. C. H. Sanford, Memphis, Tenn.—Anything that a patient suffers with as a complication of diabetes aggravates the diabetic condition.

FRUIT SENSITIVITY*

By I. S. KAHN, M.D., F.A.C.S.
San Antonio, Texas

Allergy to uncommon foods, while interesting, is comparatively rare, and relatively unimportant. Such sensitivities are usually known to the patient and are seldom the occasion of his seeking advice. Where the patient presents himself with an allergy of unknown etiology, naturally the dietary habits of his particular community offer the most likely possibilities of a correct diagnostic etiology.

To give you some idea of the size and importance of the citrus fruit industry of the lower Rio Grande valley section of Southwest Texas, only a few hours truck ride from San Antonio, the Chamber of Commerce of Harlingen, Texas, gives me the following figures for 1939-1940:

"Number of freight cars or equivalent loads shipped, 27,238. Average car load, 400 boxes, totalling 10,895,200 boxes. Each box contains one and three-fifths bushels, making a grand total of 17,432,384 bushels.*

"Aside from this, 5,700,000 cases of citrus fruit juices were processed. Each case contains 24 of the No. 2 large cans, making a grand total of 136,800,000 such cans."

During the season, a bag of grapefruit (one and three-fifths bushels) can often be purchased in San Antonio for $1.00. Oranges are but slightly higher.

This abundance, cheapness of price, market accessibility and palatability, naturally lead to an unusual use of the citrus fruits in Southwest Texas. They are daily dietary articles in practically every family in my community, even amongst our poorer people. I see a goodly number of individuals who take daily a pint of orange or grapefruit juice.

Both juices, bottled and canned, are sold as common five-cent soda fountain and soft drink beverages. A can of grapefruit juice so purchased contains the equivalent quantity of a bottle of coca-cola.

In addition, radio, the press and advertising media in general, both medical and non-medical, have made my community, as elsewhere, vitamin conscious. The vitamin content of these citrus fruits, correctly or incorrectly, has been given an appreciable emphasis in the role of combating infections, especially respiratory, leading occasionally in this connection to their protracted and extraordinary usage, especially locally, where they can be secured at such low cost.

Concerning the resulting clinical manifestations of citrus fruit allergy, in my experience, as primary or secondary factors in bronchial asthma, they are extremely rare. As primary or secondary factors in chronic vasomotor rhinitis where diet plays a part, they have to be given consideration in every case and are frequently involved. The same holds good in allergic headaches and gastro-intestinal disturbances. As a cause of angioneurotic edema, I find them rarely

*Read in Section on Allergy, Southern Medical Association, Thirty-Fifth Annual Meeting, St. Louis, Missouri, November 10-13, 1941.

*Average size grapefruit run about 75 to bushel. 120 to box. Average size oranges run about 175 to bushel, 275 to box.

implicated. Dutton* has noted instances of purpura. They are extremely important factors in cases of chronic urticaria and eczema. In fact, northern or eastern allergists have been astonished at the number of routine cases I have been able to show them where citrus fruits are proven clinical factors. Usually citrus fruit sensitivity is associated with other sensitivities.

The dermal tests in citrus fruit sensitivity are almost invariably negative. Significant intradermal tests seldom show more than a + or ++ papule. Typical pseudopotic ++++ wheals I find to be rare. In my experience, the citrus fruit reactions are usually generic. At times, curiously enough, the positive reaction secured in a clinically sensitive case, is not to the particular citrus fruit in common use and responsible for the symptoms, but to one of the other members of this group, less frequently taken. Where a clinical positive is secured to one of the fruits of this class, I find that the others are occasionally implicated to a greater or lesser degree, tests or no tests. Obviously, the degree of sensitivity is low and depends upon relatively excessive ingestion. Following symptom abeyance, the smaller quantities necessary for vitamin requirements are usually easily tolerated. Ascorbic acid substitution in my hands has been unnecessary and unsatisfactory. The citrus fruits are the fruits usually involved in our chronic allergic disturbances.

As an example of quantity ingestion in fruits other than citrus, strawberries in Mexico City are very large, delicious in flavor, and according to American price standards, very cheap. American tourists often ingest them to excess. Dr. Garnett of Mexico City tells me that urticaria from this source is one of the commonest American tourist medical nuisances which he handles. Very often, in their homes in the United States, these same cases do not have strawberry urticaria, tolerating easily the smaller amounts at the wider intervals to which they are accustomed.

Of the other fruits, next in importance in my community, in my experience, come tomato and pineapple, followed by cantaloupe and watermelon. Apple, peach, apricot and banana sensitivities I find comparatively infrequent. Berry, other than strawberry sensitivity, I also find extremely rare. After all, my end of the world is, with the exception of strawberries, not a berry country; neither is it an apple country. The man from Missouri, Michigan or Oregon who writes on this subject may have an entirely different tale to tell.

In this connection, a letter of October 14, 1941, from Dr. Mario Salazar Mallen, Chief of the Allergy Department of the General Hospital in Mexico City, regarding tropical fruits may be of some interest. He says:

> I have chanced to see in my practice a few cases of clinical sensitivity to fruits, some proven by skin tests and others only by experimental ingestion.
>
> I have seen a case of contact dermatitis from mango and have heard about a few others. The fruits more commonly involved as food allergens have been mango, banana, nuts (almond and peanut) and grapes. One of my most interesting cases was a lady having allergic symptoms and epileptic seizures in clinical relationship with so-called indigestion. She reacted weakly to banana and was asked to avoid the fruit, getting good relief. I later advised her to have, without her knowledge, banana flour in capsules provoking at once the typical seizures. I lost the patient but gained this very interesting experience.
>
> Another of my cases, a hay fever (ragweed) sufferer not sensitive to mango ate a good deal of this fruit and noticed some symptoms. Because of the lack of skin response, I persuaded her to have mangoes again. They provoked rapidly acute symptoms such as hoarseness, dyspnea and bronchitic rales (asthma). All the symptoms subsided after epinephrine was given. A third patient was so sensitive to almond (a common reactor in my experience) as to have a very severe constitutional reaction after being skin tested. My cases of sensitivity to grapes, oranges and other citrus fruits have been rarer, but a doctor, a very good friend of mine, gets slight asthma after drinking orange juice, being at the same time skin positive to the allergen. Particularly in children, I have seen urticaria from orange and lemon.

There are a number of tropical fruits not seen in the United States, such as zapotes and chirimoyas, that Dr. Mallen does not mention in his letter, for which there exists up to the present only a local market. He says nothing of encountering any allergic disturbance from them, nor have I personally seen any.

Two other tropical fruits seen and grown in the United States merit some comment, pomegranate and fig. I have never seen or heard of any allergic trouble from pomegranate. However, I have seen cases of contact dermatitis from the leaves of the fig, and urticaria due to ingestion of the raw fresh fruit.

Nix Professional Building

*Dutton, L. O.: Thrombopenic Purpura Due to Food Allergy. J.A.M.A., **111**:1920 (Nov. 19) 1938.

Southern Medical Journal

JOURNAL OF THE

SOUTHERN MEDICAL ASSOCIATION

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M. Y. DABNEY, M.D., Editor
C. P. LORANZ, Secretary, Treasurer and General Manager

Volume 35 SEPTEMBER 1942 Number 9

EDITORIAL DEPARTMENT

SOUTHERN MEDICAL ASSOCIATION
Thirty-Sixth Annual Meeting
Richmond, Virginia, November 10-12, 1942

THE RICHMOND MEETING

September finds the program of the Southern Medical Association's thirty-sixth annual meeting shaping itself up into its final form. Possibly a dozen of the section officers are serving in the army or navy. These include section chairmen, vice chairmen, and section secretaries. Some of these completed their work for the 1942 meeting before entering encampments; some are overseas and some will attend the Richmond meeting in uniform.

Although most of the programs are completely filled, places remain for a few more essayists. Any physician who has new work to present in November should write immediately to the Association office or to the secretary of the section before which he wishes to appear. A complete list of officers will be found on page 866.

EXHIBITS

Space for scientific exhibits is somewhat more limited this year than it was in St. Louis. However, this will be again a year of impressive exhibits. The development of the scientific displays each November has been phenomenal, and their value to individual members of the Association, both to those who present them and to those who study them, has increased at a tremendous rate. Some space is still available, and those who have new material to demonstrate should write to the Association office in Birmingham or to the Chairman of the Committee on Scientific Exhibits, Dr. W. Ambrose McGee, 1601 Monument Avenue, Richmond.

Hobby exhibits of physicians were enjoyable last year and there will be space for some displays of this type in Richmond. Those who have something to offer should write the Association office or to the Chairman of the Hobby Committee, Dr. Warren T. Vaughan, 201 West Franklin Street, Richmond.

HOTELS

The convention city is known for its fine hotels. The John Marshall is general headquarters and radiating center for all activities. The registration, technical, scientific and hobby exhibits, and some of the group meetings will be in the John Marshall Hotel, and other meetings will be nearby. Hotels convenient to headquarters are: The Jefferson, the Richmond, the William Byrd, the Murphy, and the Rueger. Reservations should be made through the Hotel Committee of the Southern Medical Association, Chairman of which is Dr. Fred P. Fletcher, 109 North Fifth Street, Richmond.

The meeting will convene Tuesday, Wednesday, and Thursday, November 10, 11, and 12. This is a necessary gathering, which will serve again for advancement of scientific work, and to some degree as a diversion and respite for the overworked physicians of the South. Reservations already made indicate a large attendance.

EXPERIMENTAL CATARACTS

Night blindness and drying of the cornea, keratitis, vascularization of the cornea, and several types of lens opacity may be produced at will in experimental animals and the conditions causing them are now frequently diagnosed in human beings. The most studied have been those due to vitamin deficiency. The experimental animal cataract of riboflavin deficiency was demonstrated more than ten years ago as a G-deficiency disease, before riboflavin itself was identified as a component of the water-sol-

uble group of vitamins.[1] Cataracts have also been reported as caused by other dietary errors: as by excessive feeding of the sugars, lactose, galactose, and xylose, with otherwise adequate rations. Their development emphasizes the natural difficulty of maintaining a clear pathway for admission of light to the interior of the eye.

Tryptophane is one of the so-called essential amino acids. Blindness and lens opacities in rats on a tryptophane deficient diet were mentioned some years ago. Totter and Day[2] of the University of Arkansas, have recently made detailed studies of the effects of tryptophane deficiency upon the eye of small animals. They observed a group of young rats just after weaning, on a simple ration adequate in all the necessary food elements except tryptophane. The animals lost weight in a few days, became emaciated, unkempt, and hunchbacked. Baldness about the face was noted, and greasiness of the pelt, but these were apparently not wholly due to the tryptophane deficiency. The animals were hyperexcitable, especially to noises.

More than 90 per cent of them developed cataract in from a week to two months. The majority showed vascularization of the cornea, of a type different from that which follows riboflavin deficiency. In tryptophane deficiency, blood vessel formation started from the outer canthus of the cornea and proceeded anteriorly; while in riboflavin deficiency blood vessels push in simultaneously from all directions.[2] The cataracts of tryptophane deficiency could readily be distinguished with the ophthalmoscope from those of riboflavin deficiency and those of the several sugar excesses. The tryptophane deficiency cataract and the accompanying corneal changes thus provide another variety of lens opacity and eye injury which may be produced at will for study and comparison with human cataracts and other eye disorders.

The production of eye defects in the last ten years, by different dietary measures, is like the clearing of a broad and fertile field for ophthalmologists to cultivate. The present human generation has poor vision. The eye is apparently one of the tissues which reflects a nutritional defect in a very few days, and occasionally can repair it as quickly. Experimental laboratories are furnishing invaluable leads for clinical study of the eye. Ophthalmology up to recent years has been considered a rather static specialty. The laboratories have now given it the go-ahead signal.

1. Day, P. L.; Langston, W. C.; and O'Brien, C. S.: Cataract and Other Ocular Changes in Vitamin G Deficiency. Amer. Jour. Ophth., **14**:1005, 1931.

Langston, W. C.; and Day, P. L.: Nutritional Cataract in the Norway Rat (Mus Norvegicus). Sou. Med. Jour., **26**:128 (Feb.) 1933.

Langston, W. C.; and Day, P. L.: The Arrest of Nutritional Cataract in the Albino Rat by the Use of Vitamin G (B_2). Sou. Med. Jour., **27**:170 (Feb.) 1934.

2. Totter, John R.; and Day, Paul I.: Cataract and Other Ocular Changes Resulting from Tryptophane Deficiency. Jour. Nutrition, **24**:159 (Aug.) 1942.

ESTROGENS AND DIABETES

One of the many functions of the liver would appear to be to rid the body of a toxic excess of certain of the sex hormones.[1] The much used gonadal preparations can be harmful, although the body has a few measures for protecting itself against some of them.

Insulin has provided a wonderful means of reducing the blood sugar of diabetics, but has not fully answered the questions of the mechanism of sugar utilization in the body. The adrenal secretions, both cortical and medullary (epinephrine) influence the blood sugar level, and the condition of the pituitary affects sugar tolerance. Upon extirpation of the pituitary, guinea pigs tend to go into hypoglycemic coma. Glucose must be given in the first few days following hypophysectomy to maintain life. Soon, however, the animals stabilize themselves, and reestablish a normal blood sugar level which they are able to maintain over a considerable period.[2]

The hypophysectomized guinea pigs, however, are very sensitive to administration of estrogens. Following injection of the follicle hormone, a large number will go into hypoglycemic coma and die, and this occurs regardless of sex.[2] One must conclude that a normal pituitary helps to stabilize the blood sugar level, and in its absence, or if it functions poorly, estrogen injections can be dangerous.

When estrogen is given to normal rats, the insulin content of the pancreas increases. Presumably this may be the means by which estrogens induce hypoglycemia. The pituitary has a secretion which can raise the blood sugar level, and absence of this product following hypophysectomy is perhaps the cause of the ensuing temporary hypoglycemia, which occurs as estrogen increases the pancreatic output.

1. Burrill, M. W.; and Greene, R. R.: Effect of Rat's Liver on Activity of Testosterone and Methyl Testosterone. Endocrinology, **31**:73 (July) 1942.

2. Hill, R. T.; and Stalker, W. W.: Estrogens, Blood Sugars and Liver Glycogen in Normal and Hypophysectomized Guinea Pigs. Endocrinology, **31**:89 (July) 1942.

The variability of the diabetic's reaction to insulin has been a disturbing matter for clinicians since the purification of the pancreatic hormone. Each diabetic patient, regardless of his state of nutrition, or blood or urine sugar level, must be studied individually to determine how much insulin he will require; and the individual's requirement still will vary if he has an infection or is otherwise debilitated. There are typically insulin-sensitive and insulin-resistant patients: some go into hypoglycemic shock after what seems to be a small dose of insulin, and in some the blood sugar level will not fall after what seems to be a large dose. Clinicians have long hoped to break down and classify the insulin-sensitive and insulin-resistant cases, so that the reaction to insulin can be more accurately foretold. Some hope of further enlightenment lies in study of the patient's reaction to estrogens. Estrogens might be of aid in handling an insulin-resistant case, but probably should be given with caution and careful observation to the usual diabetic patient.

The response of the diabetic to estrogen therapy will vary considerably. His reaction might provide a further classification of these patients and throw light upon the nature of their diabetes, the state of the patient's anterior pituitary gland, and the type of his response to insulin. An insulin-sensitive patient might be one with a large supply of an estrogenic or related hormone, which overstimulates his pancreas. An insulin-resistant patient might be one with an overactive pituitary, which provides too much of the blood sugar raising hormone. The estrogen-sensitive and estrogen-resistant diabetics should perhaps receive different schedules of therapy.

TWENTY-FIVE YEARS AGO

From Journals of 1917

Conscription of Medical Students.[1]—The exemption of medical students until the completion of their course has become a question of national importance, and at the same time the probability of such exemption has become so slight as to be almost negligible.

Conscription of Medical Students.[2]—The Provost Marshal decided that there is no provision in the selective service law of 1917—the conscription law—under which medical students can be exempted or discharged. The solution discovered, however utilizes a section of the National Defense Act, which was passed in 1915 * * * It is under this same law that the Medical Officers' Reserve Corps is organized. This law * * * in addition to providing for an Officers' Reserve Corps also provided for an Enlisted Reserve Corps. Medical students and interns who have been drafted * * * will be in the same relative position to the Army as physicians who are members of the Medical Officers' Reserve Corps, not on active duty * * * they will be subject to assignment to active duty when any emergency may require.

Yeast.[3]—From time to time yeast has attained a transitory popularity as a therapeutic agent * * * In Europe yeast has actually been grown on a large scale in solutions of sugar, salt and simple nitrogenous compounds for the sake of securing the much desired proteins. The utilization of yeast protein for cattle feeding is a current practice abroad;

* * * still newer is the indication that yeast is comparatively rich in at least one of the as yet unidentified accessory factors in nutrition now popularly spoken of as vitamins. * * * Yeast has been used, like extracts of rice polishings, to cure the experimental polyneuritis induced in birds by a diet of polished rice * * * There seems to be little doubt * * * that yeast * * * contains something comparable with the so-called water-soluble vitamins of the diet.

Scurvy Not a Deficiency Disease.[4]—The assumption of a detrimental effect of heat, such as is used in the ordinary cooking procedures, on the stability of the alleged anti-scorbutic vitamin is menaced by recent observations of Jackson and Moore in Chicago; for they noted * * * that * * * guinea-pigs kept on a diet of oats cannot be protected against scurvy even when fresh, unheated milk is furnished to them * * * McCollum and his colleagues at the University of Wisconsin * * * argued * * * that all animals as highly developed as the mammals may be expected to require the same chemical complexes in the diet * * * guinea pigs * * * were fed on rations that had repeatedly been demonstrated to be adequate in every way for the rat. Nevertheless, scorbutic manifestations appeared in many cases in the guinea pigs * * * McCollum ingeniously remarks that if the current explanation is correct which makes scurvy the result of a lack of a specific substance, it becomes necessary to make the further assumption that the guinea pig and man require this specific substance * * * whereas other species, including the rat, do not * * *

Obviously, as McCollum and Pitz point out * * * scurvy may not be a deficiency disease at all * * * by preventing debility of the digestive tract through stretching and contact with irritating and toxic putrefactive products of bacterial origin, McCollum and Pitz have averted and cured scurvy in guinea pigs * * * The action of orange juice is ascribed to its laxative influence rather than to any unique vitamin.

Scurvy Not a Deficiency Disease.[5]—The expression, "deficiency disease," has come to be employed in the highly restricted sense of a disorder of metabolism due to the lack of some specific unidentified dietary substance

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1. Sandock, Isadore: Correspondence. J.A.M.A., **69**:751 (Sept. 1) 1917.

2. Current Comment: Medical Students. Interns and the Draft. J.A.M.A., **69**:827 (Sept. 8) 1917.

3. Editorial: Yeast. J.A.M.A., **69**:826 (Sept. 6) 1917.

4. Etiology of Scurvy. Editorial: J.A.M.A., **69**:728 (Sept. 1) 1917.

5. Editorial: Vitamin Deficiency and Disease. J.A.M.A., **69**: 827 (Sept. 8) 1917.

or "vitamin" in the ration. Like most novel conceptions, it readily found enthusiastic advocates, precisely as the demonstration of the undisputed existence of diseases of bacterial origin made infection a popular explanation of all manner of unsolved maladies * * *.

The probable failure of the theory of a specific deficiency in the diet to account for the genesis of scurvy has recently been reviewed in THE JOURNAL. The all but complete demonstration that scorbutus is the outcome of a diet inappropriate in its physical rather than its chemical make-up justifies an attitude of skepticism regarding the validity of the "vitamin" theory of the etiology of the other diseases now classed in the same general category.

Richmond—Where We Meet

ENTERTAINMENT AND POINTS OF INTEREST

There should be no excuse for boredom at the twenty-sixth annual meeting of the Southern Medical Association in Richmond, Virginia, November 10-12, because that interesting city possesses a host of recreational facilities. All of them will be available to those attending the meeting.

Golf.—Richmond has six excellent courses, all within easy access of the convention headquarters.

The Country Club of Virginia, situated in Westhampton, has two fine courses, the Westhampton Course (5,847 yards—par 69), and the championship James River layout (6,708 yards—par 72). The Westhampton course is a short but tricky layout, and the James River course is one of the South's finest 18-hole championship links. Green fees are one dollar on week days and two dollars on week-ends.

Hermitage Country Club is another fine layout of 18 holes with yardage of 6,354 yards and a par of 73. Laid out over gently rolling hills, Hermitage is a fine test for any golfer. Greens and fairways are always in tip-top shape, and there are complete locker room facilities. Green fees are one dollar during the week and two dollars on week-ends. The club is situated just north of the city limits.

Lakeside, Richmond's third private club, has a yardage of 6,354, and a par of 71. Its tree-lined fairways put a premium on accuracy, and provide a thoroughly interesting test. Green fees are the same as at the other two private clubs. Lakeside is in the same neighborhood and the same distance from the city limits as Hermitage.

Two fine public fee courses, Glenwood Golf Club (6,251 yards—par 71), and Laurel Golf Club (6,021 yards—par 71), round out Richmond's facilities for linksmen. Both these courses are sporty and kept in good condition. Both have locker room facilities. Incidentally, Richmond's November weather is ideal for golf, tangy with the freshness of late fall, yet warm enough for complete enjoyment of all out-door sports.

Tennis.—Fine tennis courts are part of the facilities at both the Country Club of Virginia and Hermitage Country Club. Scenes of many tournaments during the year, the courts are kept in first-class condition. Also available for play are more than a score of courts scattered throughout the city.

Fishing.—Centrally situated in the state, Richmond is at the hub and within reasonable distance of many types of fishing grounds. Fresh water fishing is a popular avocation of many Richmonders. In and around this area will be found large-mouth bass, bream, silver perch, pike, and so on. In the mountain section west of the city will be found trout and small-mouth bass.

Salt water fishing in Virginia waters is all that the most ardent sportsman might desire. In these waters, for example, will be found white marlin, dolphin, blue fish, drum and bonito, rock or striped bass, trout, sharks and many other varieties.

Hunting.—Small game is plentiful throughout the counties of Virginia. Some big game hunting is also possible. The black bear is hunted each year in the Dismal Swamp and the mountains and a great many are killed.

Ample opportunities exist for bird hunting, including fresh and salt water duck, quail, grouse, wild turkey

*Prepared for the JOURNAL by the Public Relations Department, Richmond Chamber of Commerce.

Aerial view of Country Club of Virginia, location of one of Richmond's finest golf courses.

and doves. Quail are hunted in every county, wild turkey in 81 of the 100 counties, and grouse in 50.

Football.—The University of Richmond, a member of the Southern Conference, annually has a fine team, and plays many games in Richmond, either at Millheiser Field or City Stadium. The Richmond Arrows, a professional team, and a member of the Dixie League, also play many games in Richmond.

Bowling.—Richmond is recognized as one of the bowling centers of the South and has many fine alleys in all sections of the city. Situated in the John Marshall Hotel building, convention headquarters, are the John Marshall alleys, 20 of Richmond's finest. Bowling prices average 20 cents per line.

Theaters.—Richmond has 24 motion picture theaters in the downtown and outlying districts. The downtown theaters, all within easy walking distance of convention headquarters, all show first run movies along with well balanced programs. Admission prices range from twenty-eight to forty-eight cents.

In addition, the Richmond Civic Center has one of the finest auditoriums in the South, seating 5,000 persons. Concerts, opera and similar attractions are shown here throughout the year. The Richmond Theater Guild is also active. A number of worthwhile plays of the legitimate theater are brought to Richmond each year for performances at the Lyric Theater.

Dining and Dancing.—Among the hotels, the John Marshall and Jefferson lead in after dark entertainment. Both hostelries have large rooms for dining and dancing nightly to the music of good orchestras. Usual tariffs are $1.10 per person for late evening dancing, with dinner dancing ranging from $1.50 per plate up.

Carillon, located in beautiful Byrd Park, Richmond, Virginia's memorial to her dead of World War I.

The Westwood Supper Club on West Broad Street Road, just outside the city limits, is a large, roomy club with dinner and dancing nightly. Cover charges average one dollar per person.

Sightseeing.—Richmond's many historic shrines were discussed in a previous article, but for reference the following are nationally famous and should be included in any tour of the city: State Capitol, Capitol Square, Ninth and Grace Streets.

Confederate Museum, Twelfth and Clay Streets, houses the largest collection of Confederate relics in the United States.

Hollywood Cemetery, South Cherry Street, between Spring and Albemarle, burial place of two U. S. presidents, Monroe and Tyler; also burial place of Jefferson Davis, president of the Confederacy, and 18,000 Confederate soldiers.

Maymont is in Byrd Park, formerly private home of Major and Mrs. James H. Dooley. The magnificent park and museum were given by them to the city of Richmond. It has many varieties of shrubs and plants.

Medical College of Virginia.—On Twelfth Street at Broad, Marshall, Clay Streets, and vicinity, this was the only medical school in the South which kept its doors open during the entire War Between the States. Many new and modern buildings cover a wide area. It maintains schools of medicine, nursing, dentistry and pharmacy.

Monument Avenue.—Beginning at West Franklin and Lombardy Streets, and running westward, this avenue, lined with monuments to Confederate heroes, is considered one of the most beautiful residential thoroughfares in the South.

Poe Shrine.—At 1918 East Main Street, this stone residence is the oldest house in Richmond. Now the Edgar Allan Poe shrine, the museum contains many manuscripts of the famous author, and relics closely associated with his life.

St. John's Episcopal Church.—At Twenty-Fourth and Broad Streets is the most famous of all Richmond churches, which was erected in 1741. Here Patrick Henry delivered his "Liberty or Death" oration. In the churchyard is the oldest grave in Richmond, also graves of George Wythe, first professor of law in America, and Elizabeth Arnold Poe, mother of Edgar Allan Poe.

Virginia Museum of Fine Arts.—At Grove Avenue and Boulevard, this museum houses the John Barton Payne and Henry Strause collections of paintings, prints and decorative art.

Battlefields.—Just outside the city limits are the battlefields where Northern and Southern armies fought for many months. The area has been restored by the National Park Service, and most of the fortifications are still there.

Williamsburg.—Forty miles southeast of Richmond, is the old colonial capital which has been restored by John D. Rockefeller, Jr., to its former glory at a cost of $15,000,000. The restored area includes the old capitol building and many others.

Book Reviews

Treatment in General Practice. By Harry Beckman, M.D., Professor of Pharmacology, Marquette University School of Medicine, Milwaukee, Wisconsin. Fourth Edition, Thoroughly Revised. 1015 pages. Philadelphia: W. B. Saunders Company, 1942. Cloth $10.00.

Among the books on medical treatment a few, like this by Beckman, easily rank with the leaders.

Non-essentials are omitted from the discussions. Each individual disease except those that belong within the domain of the legitimate specialties, is adequately presented, and the treatment is given in whatever detail it may require, always painstakingly. Any treatment of proven worth is discussed, indications for its use are given, and their details. Dosage of drugs, diets where these are part of the treatment as in diabetes mellitus, various forms of vaccine therapy, all are presented. Dr. Beckman has used keen judgment in sorting the wheat from the chaff as regards treatment. Where he personally doubts the efficacy of a remedy he frequently mentions by name a man who favors its use.

The fourth edition shows the care with which the work has been revised; many maladies not included in former editions are given here, and indications for vitamin and endocrine preparations are inserted.

To those practitioners whose groundwork in medicine was diagnosis and not therapeutics, and the percentage is high, this book is invaluable and Dr. Beckman deserves a sincere vote of thanks for the completeness and thoroughness of the work.

Neuro-Anatomy. Walter R. Spofford, B.S., Ph.D., Instructor in Anatomy, Vanderbilt University Medical School, Nashville, Tenn. 110 pages. New York: Oxford University Press, 1942. Cloth $2.00.

This book, in a condensed form, gives the salient points of neuro-anatomy. Being in outline form it will enable the reader to orient himself more readily, though for a detailed discussion he will have to consult a larger text. A helpful book.

Preventive Medicine in Modern Practice. Edited Under the Auspices of The Committee on Public Health Relations of The New York Academy of Medicine. By James Alexander Miller, Chairman; George Baehr, Former Chairman, and E. H. L. Corwin, Executive Secretary. 851 pages, illustrated. New York: Paul B. Hoeber, Inc., 1942. Cloth $10.00.

In the preface the statement is made that "this book aims to bring about an understanding of the common objectives in the practice of medicine and public health, and thus may serve to clear the atmosphere and to bring together these two main branches of the profession in wholehearted cooperation."

It is fortunate that this statement is made. Otherwise it would be difficult to tell just what the purpose of the book might be. There are some forty-five or fifty authors, distinguished in their respective fields, writing on the various subjects, such as prevalence of disease, problems of childhood, problems of women, tuberculosis, syphilis, with a final section on methods of public health education, provision for the care of the sick, and international aspects of disease control.

Essentially, these monographs are the same as may be found in any standard work on medicine, in so far as preventive medicine is involved. But they have been much elaborated and chapters outlining the Public Health Service and tying this service more intimately into the general practice of medicine, have been inserted.

Symptom Diagnosis: Regional and General. By Wallace Mason Yater, A.B., M.D., M.S. (in Med.), F.A.C.P., Professor of Medicine and Director of the Department of Medicine, Georgetown University School of Medicine. Fourth Edition. 900 pages. New York: D. Appleton-Century Company, 1942. Cloth $10.00.

For more than a dozen years the reviewer has turned to this book for aid when diagnosis was difficult. It has been of help whenever needed. In this fourth edition there is very little change except for a few deletions and additions. Both indices have been combined in order to facilitate the use of the book. A new feature is the insertion of seventeen tables of differential diagnosis. The book cannot be praised too highly, not only as a check list but as an aid in making a difficult diagnosis.

Essentials of Pathology. By Lawrence W. Smith, M.D., Professor of Pathology, Temple University School of Medicine; and Edwin S. Gault, M.D., Associate Professor of Pathology, Temple University School of Medicine. With a foreword by James Ewing, M.D., Memorial Hospital, New York City. Second Edition. 904 pages, illustrated. New York: D. Appleton-Century Company, Inc. Cloth $10.00.

The authors' method of presenting their material is unusual. Where the discussion of specific diseases is brief, the well chosen case histories adequately supplement the text. The introductory chapters thoroughly cover the field of general pathology and give the student an excellent background for understanding the last section, on systemic pathology.

The authors have taken great pains to obtain exceptionally clear and representative photo-micrographs. These, along with the excellent colored plates, are used unstintingly to illustrate the majority of important pathologic lesions. They add to the attractiveness of the presentation and give a definite mental picture of the disease processes under discussion. The illustrations should be a great aid to those students who learn better by actually seeing the microscopic lesions than by reading another person's long descriptions.

Although the discussions are not detailed and very little experimental evidence is presented, even the rare pathologic lesions are mentioned. At the same time, its compactness makes this an excellent textbook for the medical student and reference for the practitioner.

BOOK REVIEWS continued on page 867

OFFICERS

The following is a complete roster of the officers of the Southern Medical Association for 1941-1942, and of associations meeting conjointly with the Southern Medical Association:

President—Dr. M. Pinson Neal, Columbia, Missouri.

President-Elect—Dr. Harvey F. Garrison, Jackson, Mississippi.

Vice-President—Dr. Joseph C. Peden, St. Louis, Missouri.

Secretary-Manager (Secretary, Treasurer and General Manager)—Mr. C. P. Loranz, Birmingham, Alabama.

Editor of Journal—Dr. M. Y. Dabney, Birmingham, Alabama.

Associate Editor of Journal—Mrs. Eugenia B. Dabney, Birmingham, Alabama.

Councilors—Dr. R. J. Wilkinson, Chairman, Huntington, West Virginia; Dr. E. W. Rucker, Jr., Birmingham, Alabama; Dr. S. J. Wolferman, Fort Smith, Arkansas; Dr. Oscar B. Hunter, Washington, D. C.; Dr. Walter C. Jones, Miami, Florida; Dr. Marion C. Pruitt, Atlanta, Georgia; Dr. E. L. Henderson, Louisville, Kentucky; Dr. Lucien A. LeDoux, New Orleans, Louisiana; Dr. W. Raymond McKenzie, Baltimore, Maryland; Dr. William H. Anderson, Booneville, Mississippi; Dr. Neil S. Moore, St. Louis, Missouri; Dr. William M. Coppridge, Durham, North Carolina; Dr. George R. Osborn, Tulsa, Oklahoma; Dr. J. Warren White, Greenville, South Carolina; Dr. Horton Casparis, Nashville, Tennessee; Dr. Curtice Rosser, Dallas, Texas; Dr. Thomas W. Murrell, Richmond, Virginia. Executive Committee: Dr. Henderson, Chairman; Dr. LeDoux and Dr. Hunter.

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American Public Health Association, Southern Branch (meeting conjointly with Southern Medical Association)—Dr. P. E. Blackerby, President, Louisville, Kentucky; Dr. Douglas L. Cannon, First Vice-President, Montgomery, Alabama; Mrs. Ruth George, Second Vice-President, Columbia, South Carolina; Mr. L. M. Clarkson, Third Vice-President, Atlanta, Georgia; Dr. R. H. Hutcheson, Secretary-Treasurer, Nashville, Tennessee. *Public Health Nursing Section*—Miss Ella Mae Hott, Chairman, Jefferson City, Missouri; Miss O'Connor George, Vice-Chairman, Jackson, Mississippi; Miss Pearl Barclay, Secretary, Montgomery, Alabama. *Sanitary Engineers' and Sanitation Officers' Section*—Mr. C. Heard Field, Chairman, Savannah, Georgia; Mr. R. E. Dorer, Vice-Chairman, Norfolk, Virginia; Mr. J. L. Robertson, Jr., Secretary-Treasurer, Memphis, Tennessee.

National Malaria Society (meeting conjointly with Southern Medical Association)—Dr. L. O. Howard, Honorary President, Washington, D. C.; Mr. John H. O'Neill, President, New Orleans, Louisiana; Col. J. S. Simmons, President-Elect, Washington, D. C.; Dr. H. W. Brown, Vice-President, Chapel Hill, North Carolina; Dr. Mark F. Boyd, Secretary-Treasurer, Tallahassee, Florida.

American Society of Tropical Medicine (meeting conjointly with Southern Medical Association)—Dr. Ernest Carroll Faust, President, New Orleans, Louisiana; Dr. N. Paul Hudson, President-Elect, Columbus, Ohio; Dr. Joseph S. D'Antoni, Vice-President and Secretary-Treasurer, New Orleans, Louisiana; Col. Charles F. Craig, Editor, San Antonio, Texas. *American Academy of Tropical Medicine* (meeting conjointly with American Society of Tropical Medicine)—Dr. Herbert C. Clark, President, Panama, R. de P.; Dr. L. W. Hackett, Vice-President, Buenos Aires, Argentina; Dr. Ernest Carroll Faust, Secretary, New Orleans, Louisiana; Dr. Thomas T. Mackie, Treasurer, New York, New York.

Women Physicians of the Southern Medical Association—Dr. Grace Scholz Mountjoy, Chairman, St. Louis, Missouri.

Woman's Auxiliary to the Southern Medical Association—Mrs. J. Ullman Reaves, President, Mobile, Alabama; Mrs. Richard H. Clark, President-Elect, Hattiesburg, Mississippi; Mrs. John Pierpont Helmick, First Vice-President, Fairmont, West Virginia; Mrs. Martin J. Glaser, Second Vice-President, St. Louis, Missouri; Mrs. L. S. Thompson, Recording Secretary, Dallas, Texas; Mrs. L. W. Roe, Corresponding Secretary, Mobile, Alabama; Mrs. Olin S. Cofer, Treasurer, Atlanta, Georgia; Mrs. Joseph E. Wier, Historian, Louisville, Kentucky; Mrs. W. W. Potter, Parliamentarian, Concord, Tennessee.

*Deceased.

Book Reviews

Continued from page 865

Diseases of Metabolism: A Text for the Practitioner. Edited by Garfield G. Duncan, M.D., Chief of Medical Service "B," Pennsylvania Hospital; Associate Professor of Medicine, Jefferson Medical College, Philadelphia, Pennsylvania. 985 pages, illustrated. Philadelphia: W. B. Saunders Company, 1942.

The late Sir Frederick Banting, who contributed greatly to the advance and rapprochement of fundamental research and clinical medicine through his discovery of insulin, appropriately has penned the foreword to Dr. Duncan's new work on "Diseases of Metabolism." The author's avowed purpose is to provide the physician a practical basis for the understanding, diagnosis and treatment of metabolic disorders, and thereby to fill the need for up-to-date information in that field of medical science in which sound knowledge has advanced and the laboratory worker and clinician have been drawn together rapidly during the past decade or two. In fulfillment of his objective, Dr. Duncan has selected a group of collaborators to present the respective fields in which they are recognized authorities.

The 1,000-page text contains sections devoted to basal metabolic rate determinations; carbohydrate, protein, and lipid metabolism; mineral metabolism; water balance; blood disorders; vitamins and avitaminoses; undernutrition; obesity and such disease entities as gout, hyperinsulinism, diabetes insipidus, diabetes mellitus, the various mellituhas, and the xanthomatoses and glycogen disease. Clearly the function of the editor in a work of this character, primarily designed for the practicing physician, is to integrate the individual articles into a well-proportioned composite and to strike a balance between material of an underlying physiologic nature and material of essentially clinical significance.

At least in the reviewer's judgment, these editorial functions have not been fully accomplished. The book is so bulky as to be unwieldy and lacks the delightfully integrated quality which distinguishes the classic volume on "Interpretations" in Peters and Van Slyke's "Quantitative Clinical Chemistry." Considering the text as a whole, emphasis tends to be placed upon underlying physiology and chemistry rather than upon problems of a clinical nature, and certain of the sections seem disproportionately long. It would seem that the thyroid gland and its diseases and perhaps also the bile pigments merited individual sections. The glucose tolerance test, neurogenous hypoglycemia, the serum proteins, and basal metabolic standards in children, are certain of the subjects which seem inadequately treated from the clinical viewpoint. Notwithstanding these defects, which admittedly are merely a matter of the reviewer's opinion, Dr. Duncan's text is most informative and adequately fills a gap previously existent in the medical literature.

A Manual of Pharmacology (Sixth Edition). By Torald Sollmann, M.D., Professor of Pharmacology and Materia Medica in the School of Medicine of Western Reserve University, Cleveland. 1,298 pages. Philadelphia: W. B. Saunders Company, 1942. Cloth $8.75.

This text offers a comprehensive survey of the field of drugs and their actions on the human body. During the past several years the advances in chemotherapy have been so great that many of the chapters have been thoroughly revised. This is especially true in regard to the sulfonamides, antimalarial agents, hypnotics, synthetic autonomic agents, hormones, vitamins and other new preparations. The bibliography is now limited to the past twenty years. This is an outstanding textbook of pharmacology and a favorite of both physician and student.

Synopsis of Materia Medica, Toxicology, and Pharmacology: For Students and Practitioners of Medicine. By Forrest Ramon Davison, B.A., M.Sc., Ph.D., M.B., Medical Department, The Upjohn Company, Kalamazoo, Michigan. 695 pages, illustrated. St. Louis: The C. V. Mosby Company, 1942. Cloth $5.75.

This edition uses the same format as the preceding book. The advances in chemotherapy have necessitated the revision of many sections. This is especially true in the chapter on sulfonamides. The text conforms to the changes in the proposed twelfth edition of the U. S. Pharmacopeia. A handy reference text.

The Conquest of Bacteria from Salvarsan to Sulphapyridine. By F. Sherwood Taylor. Foreword by Henry E. Sigerist. 175 pages. New York: Alliance Book Corporation, 1942. Cloth $2.00.

In this text, written for the layman, the author describes the body defenses against bacteria and disease and how the pathogens are transmitted. Next is a discussion of how drugs have been developed, climaxed at the present time by the sulfonamides. The final chapter discusses the dividends that may accrue to man from continued research.

Minor Surgery. Charles M. Oman, M.D., F.A.C.S., Rear Admiral, Medical Corps, U. S. Navy, Washington, D. C. 165 pages. New York: Oxford University Press, 1942. Cloth $2.00.

This book will serve as a working guide. The text is very inclusive and deals with such subjects as fractures, technic, fluids, dislocations, female genito-urinary organs, male genito-urinary organs, eye, head and extremities. Each page is printed on one side so that ample space for notes can be had.

Blood Disorders in Children. By I. Newton Kugelmass, M.D., Ph.D., Sc.D. Spec., Attending Pediatrician, Downtown Hospital and Pan-American Clinics, Consulting Pediatrician, Heckscher Institute for Child Health, New York City Children's Hospital. 897 pages, illustrated. New York: Oxford University Press, 1941.

This book is a text on the physiology and the pathology of the blood-forming organs in infants and children. As the book's title indicates, the author approaches the subject from the premise that there are no diseases of the blood, *per se*, but of the blood-forming organs. This practical approach as well as the fact that normal and abnormal values in hemoglobin and blood cells are given for infants and children with the proper consideration of their unstable hemopoietic sys-

tem, makes the book of definite value to pediatricians. All of the more unusual blood disorders are dealt with adequately, but the chapters on the anemias which are constantly met in pediatric practice are of especial value. The three chapters on the hemostatic system give a thorough description of the hemorrhagic conditions of the newborn. The practicing pediatrician will find that this book supplies him with authoritative information which is both comprehensive and comprehensible.

Communicable Disease Nursing. By Theresa I. Lynch, R.N., Ed.D., Instructor in Education, New York University, New York City. 678 pages, illustrated. St. Louis: The C. V. Mosby Company, 1942. Cloth $3.75.

This is an excellent text of communicable disease nursing, well printed, well illustrated and well bound. The first section orients the student as to the history, infections and resistance to them, prevention, and medical asepsis. The second section discusses the various communicable diseases and the ways in which they are spread. The third part deals with tuberculosis and the fourth with venereal diseases. The final section discusses the communicable disease in relation to the community. The student will find this a very valuable text.

Solving School Health Problems. The Astoria Demonstration Study. Sponsored by the Department of Health and the Board of Education of New York City. By Dorothy B. Nyswander, Ph.D., Director of the Study. 377 pages. New York: The Commonwealth Fund, 1942.

This book attempts to give a working solution of the school health work problem. It recognizes that in the past examinations have been a routine procedure and that not much good has resulted. The discussion outlines some of the methods that have been tried in making these examinations, charts are given as guides and detailed suggestions for determining visual acuity and hearing are related. By taking into consideration the information that has been gotten by the teacher and by the school nurse, and correlating it with the physical examination at the time the patient is before the doctor, a real advance is being made in school health work.

Doctor Bard of Hyde Park. The Famous Physician of Revolutionary Times, the Man Who Saved Washington's Life. By John Brett Langstaff. Introduction by Nicholas Murray Butler. 365 pages, illustrated. New York: E. P. Dutton & Company, Inc., 1942. Price $3.75.

This is an interesting biography of an eighteenth century physician. Dr. Bard studied in London and Edinburgh and then came back to the United States. He practiced in New York before and during the Revolution. He was interested in the founding of the College of Doctors and Surgeons of New York City. After his removal to Hyde Park he had a great deal to do with the founding of the church at that place. He was also interested in botany and the agricultural association of that time. His care of Washington while he was ill is given in detail as well as a great amount of contemporary detail of early medical and surgical practice. An interesting book about an interesting man.

Southern Medical News

OKLAHOMA CITY CLINICAL SOCIETY

The Oklahoma City Clinical Society will hold its twelfth annual conference in Oklahoma City, October 26-29. The Society has secured for this conference seventeen guest speakers and teachers, physicians well qualified to present their respective subjects. (See page 44 for formal announcement and names of speakers and teachers). Emphasis has been placed upon traumatic and industrial phases of medicine and surgery. The registration fee of $10.00 includes all the general assemblies, round-table luncheons, dinner meetings, post graduate courses and the annual smoker. Officers of the Clinical Society are: Dr. W. F. Keller, President; Dr. J. H. Robinson, Director of Clinics; Dr. D. H. O'Donoghue, Vice-President; Dr. C. P. Bondurant, Secretary; Dr. Clark H. Hall, Treasurer; Executive Committee, Dr. J. C. MacDonald, Dr. Rex Bolend, Dr. H. Dale Collins, Dr. Wendell Long, Dr. Basil A. Hayes and Dr. R. Q. Goodwin. For additional information write the Secretary, 512 Medical Arts Building, Oklahoma City.

ALABAMA

Jefferson County Medical Society, Birmingham, will hold its fourth annual Post-Graduate Seminar in the Society Auditorium located in Out-Patient Building, Hillman Hospital, Birmingham, Monday and Tuesday, September 14-15. Outstanding specialists selected to conduct the program are: Dr. Luther L. Terry, Assistant Professor of Medicine, University of Texas, Galveston, Texas; Dr. Warren H. Cole, Professor of Surgery, University of Illinois, Chicago, Illinois; Dr. Francis Bayard Carter, Professor of Obstetrics and Gynecology, Duke University, Durham, North Carolina; Dr. Charles F. Branch, Professor of Pathology, Boston University School of Medicine, Boston, Massachusetts; and Dr. C. A. Weymuller, Director of Pediatrics, Long Island College Hospital, Brooklyn, New York. Physicians from Alabama and adjoining states are invited. There is no charge for registration.

Dr. John Newdorp, Montgomery, has been commissioned in the Public Health Service Reserve as Deputy State Chief of Emergency Medical Service. The duties of the state civilian defense medical officials commissioned in the Public Health Service are to facilitate the emergency program being developed by the Medical Division of the Office of Civilian Defense and the U. S. Public Health Service so that they might exercise both state and federal responsibilities.

Dr. Buford Word, Birmingham, Medical Corps, U. S. Army, who has been stationed at Camp Shelby, Mississippi, for more than a year, was recently promoted to rank of Major.

Dr. James H. Ashcraft, formerly of Kennedy, a retired army officer, has been named Health Officer for Fayette and Pickens Counties.

Dr. Juanita Louise Bolton, Tuscaloosa, has been named Health Officer of St. Clair County.

Dr. Alexander C. McDougal, formerly of Savannah, Tennessee, has been assigned Health Officer of Marengo County.

Dr. John L. Dorough, formerly Health Officer in Oklahoma, is the new Health Officer for Claiburne County.

Dr. George Sellers Graham, Birmingham, son of the late Dr. G. S. Graham, has been named Health Officer of Greene County.

DEATHS

Dr. Frederick Douglass, Tuskegee, aged 28, died recently.

Dr. Eugene Thames, Mobile, aged 53, died recently of cardiovascular renal disease.

ARKANSAS

Sixth Councilor District Medical Society has elected Dr. Don Smith, Hope, President; and reelected Dr. C. A. Archer, Jr., Prescott, Secretary.

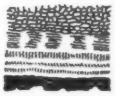
Dr. H. L. Brown, Malvern, has been elected Secretary and Treasurer of the Hot Spring County Medical Society.

Dr. J. W. Butt and Dr. George R. Storms have been elected Surgeons of the Helena Post of the American Legion.

Continued on page 44

You don't prescribe a whole poppy . . . .

You don't prescribe whole cinchona bark . . . .



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Continued from page 868

Dr. E. R. King has been elected Surgeon of the Ashdown Post of the American Legion.

Dr. Wm. H. Wilson has moved from Oxford to Griffithville.

Dr. W. F. B. Williams has moved from Des Arc to Cotton Plant.

Dr. John W. Redman has moved from Mount Ida to Fort Smith.

Dr. G. F. Hollingsworth, Hampton, has accepted appointment as physician for Dyess Colony.

Dr. T. F. Hudson has been elected President of the Luxora Rotary Club.

Dr. D. A. Dickerson has moved from Caraway to Marked Tree.

Dr. H. King Wade has been elected President of the Hot Springs Chamber of Commerce.

Dr. M. W. Chastain has been elected President of the Bentonville Rotary Club.

Dr. W. H. Abington has been elected Surgeon of the Beebe Post of the American Legion.

Dr. L. D. Massey, Osceola, has been called to active duty as Major, Medical Corps, U. S. Army, and assigned to Station Hospital, Fort McIntosh, Texas.

Dr. J. C. Barnett. Heber Springs, has been called to active duty as Lieutenant, Naval Medical Corps, and assigned to Naval Hospital, Corpus Christi, Texas.

Dr. W. P. Ward. Fordyce, has been called to active duty as Captain, Medical Corps, U. S. Army, and assigned to Station Hospital, Fort McIntosh, Texas.

Dr. W. L. Shippey, Fort Smith, has been called to active duty as Captain, Medical Corps, U. S. Army, and assigned to 92nd Station Hospital, Camp Robinson.

Dr. F. A. Corn, Jr., Lonoke, has been called to active duty as Captain, Medical Corps, U. S. Army, and assigned to Hendricks Field, Florida.

Deaths

Dr. Thomas Cowger, Danville, aged 66, died recently.

Dr. Dred R. Dorente, Fort Smith, aged 63, died recently at Ada, Oklahoma.

Dr. Robert John Hall, Wheatley, aged 56, died recently of gangrene of the lungs.

Dr. Frank Prior Hardy, Searcy, aged 55, died recently.

Dr. Leon E. King, Hot Springs National Park, aged 33, died recently of pneumonia.

Dr. Richard Marion Murphey, Belleville, aged 62, died recently.

Dr. Rufus W. Ratliff, Jonesboro, aged 77, died recently.

Dr. Benjamin Comer Routon, Ashdown, aged 29, died recently.

Dr. John Henry Weaver, Hope, aged 84, died recently following a major operation.

Dr. Joseph Stephen Westerfield, Conway, aged 90, died recently.

DISTRICT OF COLUMBIA

Deaths

Dr. Maitland Charles Bennett, Washington, aged 79, died recently.

Dr. Glenn I. Jones, Chief Surgeon, Southern Railway, Washington, aged 59, died July 18 of a heart attack.

Dr. Alfred Richards, Washington, aged 69, died recently of chronic bronchiectasis and congestive heart disease.

FLORIDA

Florida State Board of Medical Examiners has elected Dr. Isaac W. Chandler, Avon Park, President; Dr. Howard G. Holland, Leesburg, Vice-President; and Dr. William M. Rowlett, Tampa, Secretary-Treasurer, reelected. Dr. Rowlett has been Secretary and Treasurer of the Board since it was established.

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Announcing—

THE TWELFTH ANNUAL CONFERENCE OF THE OKLAHOMA CITY CLINICAL SOCIETY

October 26, 27, 28, 29, 1942

SEVENTEEN DISTINGUISHED GUEST SPEAKERS

DR. JAMES E. PAULLIN, President-Elect, American Medical Association, Atlanta, Georgia;

DR. ISAAC A. BIGGER, Surgery, Medical College of Virginia;

DR. GEORGE M. CURTIS, Surgery, Ohio State University Medical School;

DR. F. H. EWERHARDT, Physical Therapy, Washington University School of Medicine;

DR. FREDERICK H. FALLS, Obstetrics, University of Illinois College of Medicine;

DR. CHARLES C. HIGGINS, Urology, Cleveland Clinic;

DR. SARA M. JORDAN, Internal Medicine, Lahey Clinic;

DR. JOHN ALBERT KEY, Orthopedics, Washington University School of Medicine;

DR. BYRL R. KIRKLIN, Roentgenology, Mayo Foundation, University of Minnesota;

DR. ANDREW W. McALESTER III, Ophthalmology, Kansas City, Missouri;

DR. DONOVAN J. McCUNE, Pediatrics, College of Physicians and Surgeons, Columbia University;

DR. FRANK J. NOVAK, JR., Otolaryngology, Chicago, Illinois;

DR. ALBERT O. SINGLETON, Surgery, Medical Department, University of Texas;

DR. TOM D. SPIES, Internal Medicine, University of Cincinnati College of Medicine;

DR. HOWARD C. TAYLOR, JR., Gynecology, New York University of Medicine;

DR. WILLARD O. THOMPSON, Internal Medicine, University of Illinois Medical School;

DR. EUGENE F. TRAUB, Dermatology, Post Graduate Medical School, Columbia University.

General Assemblies **Round Table Luncheons** **Dinner Meetings**
Post Graduate Courses **Smoker** **Commercial Exhibits**

Registration fee of $10.00 includes ALL the above features

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pH about 6.0.	pH highly variable.
Absolutely no sugar.	About 85% sugar average.
No flavoring. No coloring. Odorless. Tasteless. Blends well with practically any food, including milk.	Contain flavoring, acid and coloring matter.
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Continued from page 44

Dr. Henry Hanson was recently appointed State Health Officer for Florida, with headquarters at Jacksonville. He served as State Health Officer of Florida from September, 1929, until December, 1935, and since that time has traveled in South America for the Rockefeller Foundation, the Pan American Sanitary Bureau and the U. S. Public Health Service. Members of the State Board of Health are Dr. Herbert L. Bryans, Pensacola, President; Dr. Robert B. McIver, Jacksonville, and Mr. William Parr, Tampa.

Florida Board of Examiners in the Basic Sciences will hold its next examination October 31 at the University of Florida, Gainesville. Requests for application blanks should be sent to Dr. John F. Corn, Secretary, Statson University, DeLand, Florida.

Dr. J. N. Moore, Ocala, was granted a Fellowship in the American College of Radiology at the Atlantic City meeting in June.

Dr. Wilson Lancaster, Kissimmee, has been doing special work in surgery at the Harvard University Postgraduate School.

Deaths

Dr. Curtis A. Boorman, St. Petersburg, aged 79, died recently of carcinoma of the bladder.

Dr. Albert Harry Fagerstrom, Clearwater, aged 56, died recently of diabetes mellitus.

Dr. Tilden Hendricks Phibbs, Jr., Tampa, aged 30, was killed in an airplane accident June 5 in the Far Eastern theater of war.

Dr. John Lee Summerlin, Gainesville, aged 52, died recently of coronary thrombosis.

GEORGIA

Dr. James E. Paullin, Atlanta, President of the American College of Physicians, has announced that its 27th annual session will be held in Philadelphia, Pennsylvania, April 13-16, 1943. Dr. Paullin will have charge of the program of general sessions and lectures, and Dr. George Morris Piersol, Philadelphia, Pennsylvania, General Chairman, will be responsible for the program of hospital clinics, panel discussions, local arrangements, entertainment, etc. Mr. E. R. Loveland, Philadelphia, is Executive Secretary.

Emory Medical Alumni Association at its twenty-first annual meeting held recently elected Dr. Walter C. Jones, Miami, Florida, President; Dr. Spencer A. Kirkland, Atlanta, First Vice-President; Dr. Russell Thomas, Americus, Second Vice-President. New members of the Board of Trustees are Dr. W. K. Purks, Vicksburg, Mississippi; and Dr. J. D. Martin and Dr. C. W. Strickler, Jr., both of Atlanta.

Dr. M. E. Winchester, Brunswick, Glynn County Commissioner of Health, returned recently from Chicago, where he was presented by the U. S. Chamber of Commerce with a plaque on behalf of Glynn County for its outstanding achievements in public health work.

Dr. J. L. Morris, Alpharetta, announces the opening of a maternity clinic.

Dr. Frank K. Boland, Atlanta, Professor of Clinical Surgery at Emory University School of Medicine, has been reelected President of the Emory Alumni Association.

Dr. Benjamin Bashinski, Macon, has resigned his position in charge of the Junior League Well Baby Clinic which he has attended for thirteen years.

Dr. Grady N. Coker, Canton, was recently initiated into Alpha Omega Alpha, national medical fraternity.

Dr. M. L. Malloy, Vienna, announces the opening of an office in the Taylor Memorial Hospital, Hawkinsville, for the practice of medicine, maintaining his office in Vienna for practice also.

Dr. Curtis Weal Bowman, Macon, and Miss Mary Louneal Williams, Atlanta, were married recently.

Deaths

Dr. Edmund Lee Awtry, Atlanta, aged 74, died recently.
Dr. Ein Collum, Springfield, aged 61, died recently of paralysis.
Dr. Victor Emanuel Kea, Atlanta, aged 52, died recently.
Dr. Jake Cobb Orr, Buford, aged 56, died recently.

Continued on page 48

SANDOZ

CALCIUM ACTION combined with BROMINE SEDATION

CALCIBRONAT

CALCIUM-BROMIDO-GALACTOGLUCONATE

A new organic salt with the high calcium ratio—1 Ca : 2 Br
Less danger of bromism — Palatable — Well tolerated

EFFERVESCENT TABLETS: Tins - 10 and 50
GRANULES (non-effervescent): Tins - 100 and 500 Gm.
AMPULES: 10 cc.
BOXES: 5, 20 and 100

Literature and samples on request

SANDOZ CHEMICAL WORKS, Inc. • New York, N. Y.

GREEN AND RED LABEL DRIED BREWERS' YEAST

After all done, all written, grain grown dried brewers' yeast remains the most potent, concentrated source not only of the whole vitamin B complex but the whole of the pellagra preventive factor. Although nicotinic acid and riboflavin are important parts of the vitamin B complex and the pellagra preventive factors they are, alone, inadequate parts.

Following the discovery of the causes, relief and prevention of pellagra by Goldberger, Wheeler and their associates, Federal, State and County health officials and neighborhood physicians got busy. There is no reason why pellagra, within the next few years, cannot be ended and prevented.

Entering the campaign in 1927 with a supply of dried brewers' yeast potent in Goldberger's P-P (pellagra-preventive) factor and the full vitamin B complex, we wrote and widely distributed the following:

> "Pellagra is caused by a one-sided diet. Let all note this. Let no one urge one single product to the exclusion of everything Dr. Goldberger and his associates found valuable. Human life is too important to not be informed of every possible prevention and relief. Those afflicted with pellagra, or eating a diet which causes it, need more milk and eggs, more lean meat and dried grain yeast, vegetables and fruits."

Again we wrote:

> "Conservatism must be the rule in projecting products for use in human disease. The recovery and life of the patient, the professional reputation of the physicians are at stake."

THE FIXED POLICY

The president of this company, for a long time in pure food and public health work and knowing that all disease must be accurately diagnosed and all needed treatment had, has insisted that the use of dried brewers' yeast and other vitamin products in disease shall be restricted to medicine.

It is from such foundation that Vitafood Dried Brewers' Yeast continues to be presented to the physicians for use in pellagra and for use to furnish the whole of the dried brewers' yeast B complex.

There are two types of Vitafood Dried Brewers' Yeast. The Red Label has had the hop flavor substantially removed; whereas the Green Label retains the hop flavor.

Samples for clinical or professional use will be sent on request.

VITAMIN FOOD COMPANY, INC.
VITAMIN RESEARCH LABORATORIES, INC.

122 Hudson Street **New York, N. Y.**

Continued from page 46

KENTUCKY

Dr. James A. Outland, Murray, Health Officer of Calloway County, will take over the work in Trigg County, succeeding Dr. Leonard A. Crosby, Eddyville, who resigned as Health Officer of Caldwell, Lyon and Trigg counties.

Dr. James T. Duncan, Columbia, Health Officer of Adair County since 1937, resigned to become Director of the Bureau of Tuberculosis of the West Virginia State Department of Health.

DEATHS

Dr. William Aubrey Pool, Lexington, aged 60, died recently of injuries received in an automobile accident.

Dr. Theodore Sallee, Covington, aged 73, died recently of lobar pneumonia.

Dr. Edward E. Underwood, Frankfort, aged 77, died recently of cardiorenal disease.

LOUISIANA

Orleans Parish Medical Society, having approved a plan to make a financial contribution to the National Physicians Committee which is fighting for the preservation of medical service in the United States and which is in need of additional funds to carry on the work it has planned, appointed the following as representatives of each hospital in New Orleans to act as local agents for making a complete canvass of the doctors in the city; Dr. Joseph W. Reddoch, Baptist Hospital; Dr. Leon Menville, Charity Hospital; Dr. Wm. B. Clark, Eye, Ear, Nose and Throat Hospital; Dr. A. V. Fredrichs, French Hospital; Dr. Daniel J. Murphy, Hotel Dieu; Dr. Edwin L. Zander, Mercy Hospital; Dr. G. C. Anderson, Touro Infirmary; Dr. Clyde Brooks, Louisiana State University Medical School; and Dr. John H. Musser, Tulane Medical School.

At a recent meeting of the Diocesan Council of Catholic Women, Dr. Ruth G. Aleman was appointed Chairman of the Legislative Committee; Dr. Katherine Havard, Chairman of the Speakers' Bureau; and Dr. Maud Loeber, Chairman of the Health Committee, all of New Orleans.

Dr. Roy B. Harris, New Orleans, has been elected a member of the National Board of Medical Examiners for a term of four years.

Dr. David E. Brown, Ferriday, was recently appointed Director of the Louisiana State Board of Health, succeeding Dr. C. L. Mengis, New Iberia.

Dr. C. P. Gray has become Superintendent of the E. A. Conway Charity Hospital, Monroe, replacing Dr. D. T. Milam.

Dr. Edward B. Faget, New Orleans, has been appointed a member of the City Health Department's clinic staff.

Dr. H. W. Kostmayer, Dr. Alton Ochsner and Dr. W. A. Sodeman, all of New Orleans, recently spent some time in Venezuela studying hospitals of the Standard Oil Company, Venezuelan medical schools and premedical courses.

Louisiana State Medical Society has awarded a medal to Dr. Arthur L. Koven and Dr. William R. Whitehouse, graduates in 1942 respectively of Louisiana State University School of Medicine and Tulane University School of Medicine, New Orleans, for their work on tropical disease and preventive medicine.

DEATHS

Dr. Otis Manly Patterson, Bastrop, aged 81, died recently of influenza and pneumonia.

MARYLAND

Dr. Arthur J. Lomas, Baltimore, has been commissioned in the Public Health Service Reserve as Deputy State Chief of Emergency Medical Service.

Dr. James H. Mason Knox, Jr., Baltimore, who recently retired as Director of the State Bureau of Child Hygiene, has been appointed Consultant in Child Hygiene. Dr. Knox has been Chief of the State Bureau since its establishment in 1922.

DEATHS

Dr. David Newton E. Campbell, Baltimore, aged 71, died recently.

Continued on page 50

The New Emmert-Gellhorn Pessary

An improved device for treatment of inoperable uterine prolapse

For use in cases of inoperable uterine prolapse, this new pessary is offered as an improvement upon the well-known Gellhorn Pessary, long used with great success. The Emmert-Gellhorn Pessary is made of one solid piece of Neicomold, a synthetic material that may be boiled. The material is unbreakable and stays smooth in use since it is unaffected by the genital secretions. Neither does it affect or irritate the vaginal mucosa. The shape is approximately that of a mushroom, with the upper surface slightly depressed.

Instead of a solid stem, the Emmert-Gellhorn Pessary employs a stem having a hole drilled throughout its length. This offers the considerable advantage of drainage, preventing accumulation of dammed-up secretions. This permits fewer removals of the pessary for cleaning, of great benefit to the patient, particularly since many of those using this pessary are aged and find such frequent manipulation and visits to the physician a severe handicap.

The stem of the new pessary is ¼ inch shorter than that of the former pattern, and does not terminate in the knob formerly used. A slight hollowing of the stem near the end, however, allows easy grasp for removal. In weight, the Emmert-Gellhorn Pessary has the advantage of being considerably lighter. This decreased weight also adds to the comfort of the patient.

PRICE—JE5162 — Emmert-Gellhorn Pessary, Diameter 2 or 2½ inches, STATE SIZE, Each $2.25

SPECIAL SIZES: 2¼, 2¾ or 3-inch may be had on order at, each $2.75

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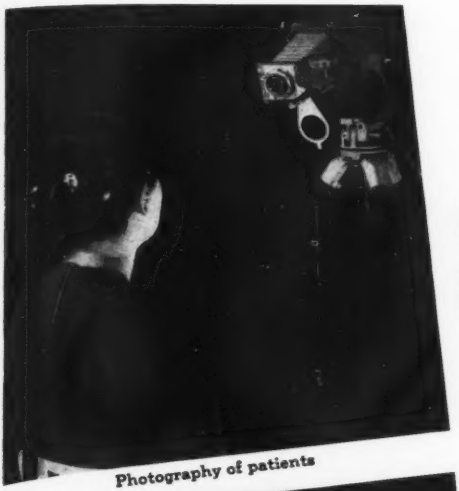
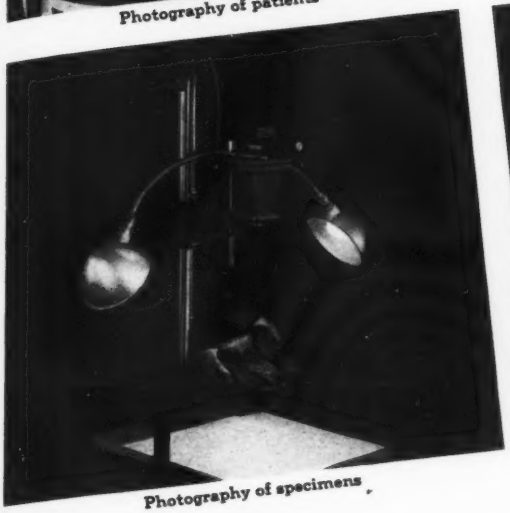


Photography of patients

If it has to do with photography . . .



Photography of specimens

Copying radiographs

consult KODAK Perhaps you do not fully realize how much helpful information and advice concerning photography in medical practice and research Kodak makes freely available. Write as often as you desire, outline your problems at length, pose as many questions as you wish. Your letters will be welcome, for the efficient utilization of photographic materials in this scientific field is as important to Kodak as it is to the profession.

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Continued from page 48

Dr. Thomas Lynch, Waldorf, aged 83, died recently.

Dr. Ira Clinton Tyndall, Berlin, aged 68, died recently.

Dr. Elijah Wootton White, Poolesville, aged 60, died recently of coronary occlusion.

MISSISSIPPI

Dr. Ellis P. Burns, formerly of Tucson, Arizona, has been assigned Chief Medical Officer at the Veterans Administration Facility, Biloxi, succeeding Dr. Ira L. Parsons, who retired from active service. Dr. Parsons has served the Facility as Chief Medical Officer since its opening in 1933.

Dr. Gettis T. Sheffield, formerly of Downey, Illinois, has been appointed head of the Veterans Administration Facility, Gulfport, succeeding Dr. George M. Melvin, who has been transferred to Roseburg, Oregon.

Dr. D. B. Wilson, U. S. Public Health Service, Gulfport, is now Acting Director of Harrison County Health Department.

Dr. A. M. McCarthy, Meridian, has been promoted from the rank of Major to Lieutenant Colonel. He is at present in charge of the Surgical Service at the Fort Benning Hospital.

Dr. F. L. McGahey is Director of the Grenada County Health Department, succeeding Dr. R. A. Clanton. Dr. Clanton still resides in Grenada.

Dr. David M. Pennebaker, Lieutenant, Medical Corps, U. S. Army, formerly of New Albany, was recently assigned to duty at Keesler Field.

Deaths

Dr. James Thomas Dean, Moorhead, aged 82, died recently.

MISSOURI

Rev. Alphonse M. Schwitalla, S.J., Ph.D., St. Louis, Dean of St. Louis University School of Medicine, has been reelected President of the Catholic Hospital Association of the United States and Canada.

Dr. Borden S. Veeder, St. Louis, has been elected Chairman of the St. Louis Chapter of the American Red Cross.

Deaths

Dr. Charles F. Anderson, St. Louis, aged 83, died recently of acute bronchitis.

Dr. Oliver H. Campbell, St. Louis, aged 71, died recently of carcinoma.

Dr. Floyd Kinsolving, Hornersville, aged 79, died recently of chronic asthma.

NORTH CAROLINA

Dr. Sylvester D. Craig, Winston-Salem, has been commissioned in the Public Health Reserve as Deputy State Chief of Emergency Medical Service.

Dr. John S. Chamblee, Windsor, formerly Health Officer for Bertie and Chowan Counties, will take over the work in Gates County, succeeding Dr. Thomas G. Faison, Winton, Health Officer for Hertford and Gates Counties, who has entered active service.

Dr. Paul P. McCain, Sanatorium, Superintendent of the North Carolina Tuberculosis Sanatorium, and the Western North Carolina Tuberculosis Sanatorium, Black Mountain, has been named Superintendent of the Eastern North Carolina Tuberculosis Sanatorium now under construction at Wilson.

Dr. Hermon C. Mason, Ph.D., has been appointed Associate Professor of Bacteriology at the University of North Carolina School of Medicine, Chapel Hill.

Dr. Grady Milton Colson, Goldsboro, and Miss Love Norris, Wilmington, were married recently.

Dr. Charles W. Hock and Miss Margaret Henley, both of Winston-Salem, were married recently.

Dr. Charles Mattox Kendrick, Valdese, and Miss Clara Josephine Payne, Lenoir, were married recently.

Dr. Samuel Edward Warshauer and Miss Miriam Miller, both of Wilmington, were married recently.

Dr. Henry Stokes Munroe, Jr., and Miss Martha Blanton Matthews, both of Charlotte, were married recently.

Continued on page 52

For the Failing Heart

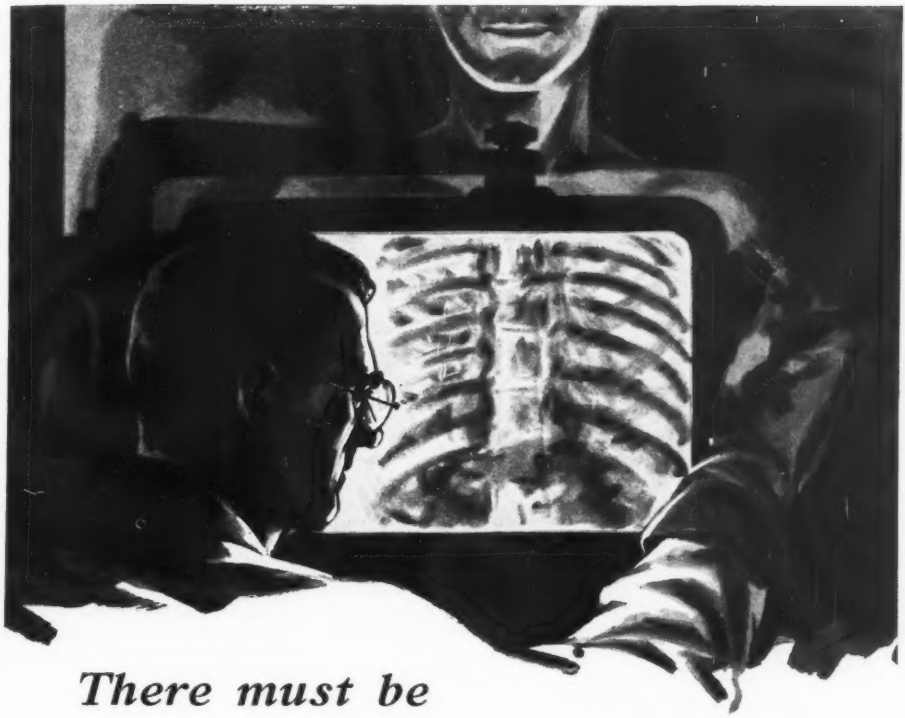
Phyllicin

A "theophylline" for oral administration — quick acting and well tolerated. For the relief of cardiac distress and pain, to diminish dyspnoea and to reduce edema.

DOSE: 1 or 2 tablets (4 grains each) after meals.

Phyllicin, brand of theophylline-calcium salicylate, Trade Mark reg. U. S. Pat. Off.

Bilhuber-Knoll Corp. Orange, N. J.



There must be

NO "BLACKOUT" HERE!

X-Ray today has many newer roles than that of assisting the medical profession. Flashing through inches of steel to reveal interior flaws in a pressure vessel . . . guarding against weak spots in a battlewagon's armor plate . . . lifting the mask from doubtful portraits by an "old master".

But still *the most important* is the day-by-day job of X-Rays in preserving health and combating disease. Today, this job takes on new significance. For, as essential as the strength of our fighting men at the front is the health of our home army who forge their weapons.

The fluoroscope has a vital part assisting you in the nation's health program. And the X-Ray equipment and supply manufacturers have a vital responsibility in maintaining the quality and quantity of your "weapons".

Ever mindful of its obligation to the medical profession in both military and civilian services, Patterson has increased its vigilance over every step of production. Research and manufacturing facilities are keyed to the demands of the war emergency. And so, Patterson Screens in all types of service, and under every operating condition are giving the unexcelled performance expected of them.

PATTERSON'S
facilities devoted 100%
to Public Health and Defense
of the United Nations

THE
PATTERSON SCREEN CO.
TOWANDA, PA., U. S. A.

Patterson X-Ray Screens

Continued from page 50

DEATHS

Dr. Allen Jones Jervey, Jr., Tryon, aged 30, died somewhere in the Pacific June 17 of gunshot wounds.

OKLAHOMA

Dr. George R. Osborn, Tulsa, has been appointed a member of the Council of the Southern Medical Association from Oklahoma and as such is the official representative of the Association in Oklahoma, the appointment having been announced recently by the President, Dr. M. Pinson Neal, Columbia, Missouri. Dr. Osborn succeeds the late Dr. Robert M. Anderson, Shawnee.

Dr. Henry H. Turner, Oklahoma City, is the new Chairman of the Associated State Postgraduate Committees.

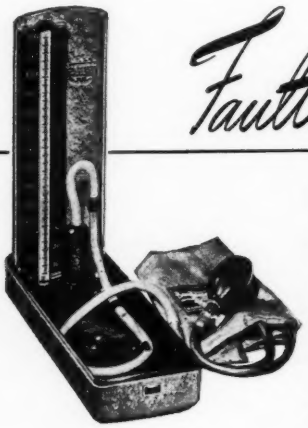
Dr. A. S. Riser, Blackwell, was appointed a Sergeant-at-Arms by the Speaker of the House of Delegates at the meeting of the American Medical Association at Atlantic City in June.

The Rogers County Medical Society gave a farewell dinner at the Will Rogers Hotel in Claremore, honoring Dr. P. S. Anderson and Dr. Earl E. Bigler, both of Claremore, who were leaving for the armed services. Dr. Anderson is now stationed at Miami, Florida, and Dr. Bigler at Fort Sill, Oklahoma.

Dr. O. C. Coppedge, Bristow, has been elected Secretary of the Creek County Medical Society to fill the unexpired term of Dr. O. H. Coward, who resigned to enter the army.

Dr. Bela Halpert, formerly of New Orleans, Louisiana, has

Continued on page 54



Faultless Equipment...

will lighten your burden on the civilian front

While the armed services continue to draw heavily upon the ranks of professional men, there remain thousands of physicians who must assume the increased burden of protecting the health of the civilian population. Now, more than ever before, the constant serviceability of equipment is important . . . today, quality counts!

Factually, there are over 200,000 Baumanometers in use in hospitals and offices of private practitioners. Under the existing emergency, physicians cannot afford to be handicapped by using instruments that have lost their inherent accuracy. Aside from the clinical aspects, this would result in loss of time—and time is a vital factor. Accurate, trouble-free bloodpressure service is indispensable. Why not order a precision-tested, true mercury-gravity Baumanometer without delay.

Get the **FACTS** *and you will buy a Lifetime Baumanometer*

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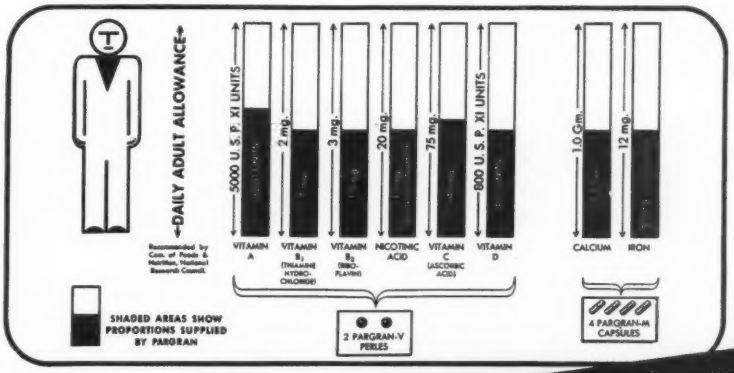

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and get an adequate, vitamin-mineral supplement

Now, more than ever before, it is necessary to make certain that our people are receiving adequate amounts of accessory food elements. Now, with physicians busier than ever, there is need for products which will simplify the application of the basic principles of good nutrition.

The House of Squibb has made a real contribution to practical nutrition by providing Pargran-V and Pargran-M. Study the charts above and you will see that Pargran—

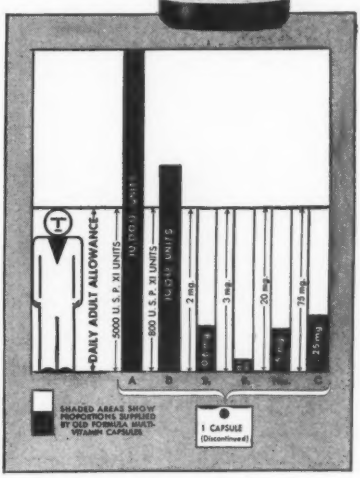
. . . provides a rationally balanced and adequate vitamin-mineral supplement for use when food sources fail;

. . . fulfills the recommendations of the Committee on Foods and Nutrition of the National Research Council;

. . . affords flexibility of dosage—supplying vitamins or minerals or both—in ¼, ½, ¾ or the full daily allowance;

. . . provides the advantages of convenience and economy.

Write now for complete information concerning Pargran-V and Pargran-M. Address Professional Service Department, 745 Fifth Ave., New York



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MANUFACTURING CHEMISTS TO THE MEDICAL PROFESSION SINCE 1858

The chemical composition of Karo in glass and in tins is identical

Infant Formulas

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EFFECTIVE formulas provide two-thirds of the total calories in milk and one-third in added carbohydrate. Whatever milk is indicated usually may be modified safely with KARO Syrup.

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Free to Physicians

"Infant Feeding Manual For Physicians" is a concise, helpful monograph containing specific information and tested Karo feeding formulas. Sent postpaid.

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Continued from page 52

been appointed Director of Laboratories of the State University and Crippled Children's Hospitals and Professor of Clinical Pathology at the University of Oklahoma School of Medicine, Oklahoma City.

Dr. John Hartwell Dunn, Heavener, and Miss Gladys Edna Moody, Drew, Mississippi, were married recently.

DEATHS

Dr. Henry C. Childs, Tulsa, aged 64, died recently.
Dr. Henry J. Daily, Oklahoma City, aged 33, died recently.
Dr. Allen C. Jenner, Durant, aged 68, died recently.
Dr. William H. Wilson, Ponca City, aged 86, died recently.

SOUTH CAROLINA

Second District Medical Society has elected Dr. William Weston, Jr., President; Dr. R. B. Donovan, Jr., Edgefield, Vice-President; and Dr. David St. P. Asbill, Secretary-Treasurer, all of Columbia.

Dr. F. E. Zemp, President of the Columbia Medical Society, recently entertained the members of the Society with a barbecue at the country estate of Dr. William Weston between Congaree and Gadsden.

Dr. James H. McIntosh, for forty-two years a practitioner in Columbia, was recently presented with a silver pitcher by the Columbia Medical Society in recognition of his many years of service in the community.

Dr. H. Grady Callison, Columbia, has been commissioned in the Public Health Service Reserve as State Chief of Emergency Medical Service.

Dr. R. S. Matthews, Columbia, who recently reported for duty with the National Guard at Fort Jackson, has been promoted to the rank of Major.

Dr. George R. Laub has opened an office in Camden for the practice of eye, ear, nose and throat.

Dr. A. J. Buist, Jr., Charleston, who has been on sea duty with the fleet in the Pacific for several months, recently returned home and reported for duty at the Charleston Navy Yard.

Dr. Henry C. Robertson, Jr., Dr. William J. Ball and Dr. Robert J. Baker, all of Charleston, have reported for duty in the armed forces.

Dr. Bothwell Graham, III, Clinton, has left for Parris Island, where he has been assigned to the staff of the Naval Hospital as a Lieutenant.

Dr. R. Murdock Walker, Sumter, has reported for duty with the armed forces.

Dr. David R. Stack, Jr., Charleston, is now stationed at Camp Pickett, Virginia.

Dr. P. M. Kinney, Dr. William Evans and Dr. L. Paul Barnes, all of Bennettsville, have reported for duty in the armed forces.

Dr. J. E. Lipscom, Greenville, has sailed for foreign duty.

Continued on page 56

Classified Advertisements

RATES for insertion in the Classified Column are as follows: $2.00 minimum, which includes the first 50 words; for each word in addition to the original 50 words, the charge is 3c.

EDITING—Preparation of papers and reports, indexing, abstracting, bibliographies and similar services to physicians. Address inquiries to Elizabeth M. McFetridge, M.A., 4810 St. Charles Avenue, New Orleans, Louisiana.

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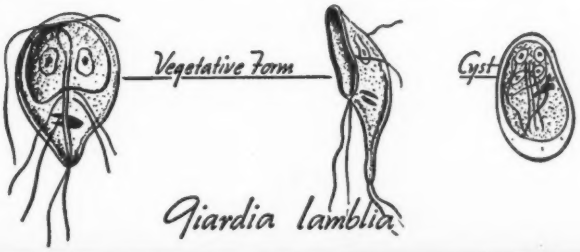

GIARDIASIS

. . . Although evidence for the pathogenic nature of Giardia lamblia is not conclusive, this microorganism may possibly be the cause of diarrhea, abdominal pain and other symptoms of the clinical picture commonly referred to as giardiasis.

It has recently been demonstrated that Giardia lamblia can be eradicated from the intestinal tract with remarkable promptness by the administration of Atabrine Dihydrochloride.

The usual dose of Atabrine Dihydrochloride is 0.1 Gm. three times daily for five days.

ATABRINE

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DIHYDROCHLORIDE

Brand of Quinacrine Hydrochloride

Chemotherapeutic Specific Against Malaria

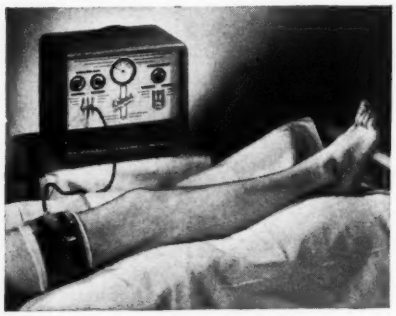
WINTHROP CHEMICAL COMPANY, INC.

Pharmaceuticals of merit for the physician

NEW YORK, N. Y. WINDSOR, ONT.

ONE OF YOUR MOST USEFUL PRESCRIPTIONS

IN PERIPHERAL VASCULAR DISEASE



You can prescribe a Burdick Rhythmic Constrictor as easily as you prescribe the simplest medication.

A request by 'phone or postcard to your local Burdick dealer will bring a Rhythmic Constrictor to any address quickly.

The cost to the patient is low—rental rates are reasonable.

The Burdick Rhythmic Constrictor has established its value in the following conditions:

Peripheral vascular sclerosis
Early thrombo-angiitis obliterans
Acute vascular occlusion
Diabetic ulcers
Intermittent claudication
Chilblains

Burdick Rhythmic Constrictor

QUIET PORTABLE EFFECTIVE

The BURDICK CORPORATION
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Milton, Wisconsin

Send me information on The Burdick Rhythmic Constrictor for home use and for office use.

Dr. .....

Address .....

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Continued from page 54

Dr. Philip Edward Assey and Miss Josephine Frances Lee, both of Georgetown, were married recently.

Dr. Joe Crosland, Greenville, and Miss Mary Howard were married recently.

Dr. Edith Eskrigge and Mr. C. Wycliffe Haynes, both of Columbia, were married July 8.

Dr. Gerald Watts Scurry, Columbia, and Miss Emily Jordan Thomas were married recently.

Deaths

Dr. J. Walker Curry, Rome, aged 66, died recently.
Dr. E. Clay Doyle, Seneca, aged 68, died recently.
Dr. Robert M. Graham, Lake City, aged 55, died recently.
Dr. James Henley Mills, Mayesville, aged 61, died recently.
Dr. W. A. Whitlock, Jr., Laurens, aged 42, died recently.

TENNESSEE

Dr. E. E. Northcutt has moved from Newport to Hatteras, North Carolina.

Dr. Francis H. Cole has moved from Nashville to Oakville Memorial Hospital, Oakville.

Dr. Irving H. Hillard, formerly of Nashville, is at Station Hospital, Camp Davis, North Carolina.

Dr. Cleo M. Miller, formerly of Nashville, is now at Panama City, Florida.

Dr. Bernard M. Weinstein, formerly of Nashville, is now at Station Hospital, Fort McClellan, Alabama.

Dr. H. D. Hickey, formerly of Chattanooga, is at Camp Rucker, Alabama.

Dr. J. M. Higginbotham, formerly of Chattanooga, is at the William Beaumont General Hospital, El Paso, Texas.

Dr. Robert A. Wise, formerly of Chattanooga, is at the LaGard General Hospital, New Orleans, Louisiana.

Dr. William S. Muse, formerly of Knoxville, is at the U. S. Naval Hospital, Charleston, South Carolina.

Dr. O. F. Forseid has moved from Morristown to Neenan, Wisconsin.

Dr. Herschel Penn, formerly of Knoxville, is at the U. S. Naval Air Station, Jacksonville, Florida.

Dr. Joe L. Raulston has moved from Fountain City to William Beaumont Hospital, El Paso, Texas.

Dr. Ben H. Warren, Gallatin, has moved to Lexington, Kentucky.

Dr. James F. Morton, formerly of Kingsport, is at Camp Gruber, Muskogee, Oklahoma.

Dr. A. L. Herring, formerly of Memphis, is at Barksdale Field.

Dr. Charles Whitman Borg, formerly Health Officer of Hardin County, is now at Keesler Field, Biloxi, Mississippi.

Dr. Leo Harris, Jr., Lawrenceburg, is located at the Lawson General Hospital, Atlanta, Georgia.

Dr. Edwin E. Miller, Knoxville, and Miss Clara Gene Rosenfield, Jellico, were married recently.

Deaths

Dr. George W. Brasher, Jackson, aged 71, died recently of pneumonia.

Dr. James Robert Craig, Ripley, aged 70, was found dead in bed recently of cardiovascular disease.

Dr. W. B. Eason, Jackson, aged 67, died recently.

Dr. Benjamin H. Harrison, Burlison, aged 69, died recently of chronic valvular heart disease.

Continued on page 58

Chicago Eye, Ear, Nose & Throat College
Established 1897
231 W. Washington St., Chicago, Ill.

Practical postgraduate course in Ophthalmology and Otolaryngology.

Doctors admitted at any time for review and clinical observation.

OSCAR B. NUGENT, M.D., Director

..."Git thar fustest with the mostest!"*

*Gen. Nathan Bedford Forrest

It's not only good soldiering . . . it's good medicine to strike early and strike hard.

That's why, in dealing with borderline vitamin B deficiencies, you will want to attack the problem with a B complex preparation of real potency—

BETA-CONCEMIN

Brand of B Vitamins

WHOLE VITAMIN B COMPLEX IN HIGH POTENCY

The suggested daily dose (3 teaspoonfuls Elixir Beta-Concemin or 6 Beta-Concemin Tablets) supplies:

Vit. B_1 (thiamine HCl , 3 mg.)	1000 U.S.P. units
Vit. B_2 (riboflavin, 2 mg.)	2000 micrograms
Nicotinic acid amide	15 milligrams
Vit. B_6 (pyridoxine HCl , 0.45 mg.)	450 micrograms
Pantothenic acid (0.225 mg.)	225 micrograms

All other factors of vitamin B complex as derived from liver

Pleasant, fruit-flavored Elixir Beta-Concemin is available at prescription pharmacies in 4-oz. and 12-oz. bottles; Beta-Concemin Tablets in bottles of 100.

In Anemia—Complete Vitamin B Complex with Ferrous Iron

Capsules

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Bottles of 100

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Trade Mark "Beta-Concemin" Reg. U. S. Pat. Off.

Continued from page 56

Dr. William Thomas Harvell, Oakland, aged 65, died recently of encephalomalacia of the occipital lobes.

Dr. Benjamin Victor Howard, Knoxville, aged 53, died recently of coronary occlusion.

Dr. Richmond McKinney, Memphis, aged 68, died recently.

Dr. Eugene Rison Timmons, Grand Junction, aged 48, died recently of malignant condition of the pancreas.

TEXAS

Texas Society of Gastro-Enterologists and Proctologists has elected Dr. James J. Gorman, El Paso, President; Dr. Tom E. Smith, Dallas, now Captain Tom E. Smith at Fort Sam Houston, Vice-President; Dr. G. E. Brereton, Dallas, Vice-President; and Dr. George M. Underwood, Dallas, Secretary-Treasurer.

University of Texas School of Medicine Alumni at its recent annual dinner installed Dr. C. O. Terrell, Fort Worth, President; and elected Dr. George Underwood, Dallas, President-Elect; Dr. L. B. Jackson, San Antonio, Vice-President; and Dr. W. W. Bondurant, Jr., San Antonio, Secretary-Treasurer, reelected.

Dr. J. M. Martin, Dallas, was recently honored when the Texas Radiological Society at its annual meeting in Houston adopted a resolution expressing appreciation of his outstanding services to the specialty of radiology in the Southwest. He was presented a bronze plaque with the signatures of active members of the Society engraved on it.

Southwestern Medical Foundation was given the home property of the late Dr. C. M. Grigsby of Dallas by terms of his will which directed that his home and its furniture be sold, the proceeds to go to the Foundation for the establishment of the Clarence M. Grisby Memorial Fund to buy medical literature for the Baylor University College of Medicine, Dallas.

Dr. C. T. Stone, Professor of Medicine, University of Texas School of Medicine, Galveston, was selected by the faculty to serve as a member of the Advisory Committee to the Board of Regents of the University in connection with the selection of an Executive Vice-President for the School of Medicine.

Dr. Don Price, Athens, was recently appointed Health Officer of Athens.

Dr. Charles L. Martin, Dallas, was elected President-Elect of the American Radium Society at its recent annual conference.

Dr. Lee Janice, formerly of New York City, has been appointed Director of the Texarkana-Bowie Counties Health Unit, succeeding Dr. W. V. Bessonnette, who is now Director of the Palo Pinto-Parker Counties Health Unit.

Dr. Vance Terrell, Stephenville, has returned from postgraduate study in eye, ear, nose and throat in Philadelphia.

Dr. T. G. Blocker, Assistant Professor of Surgery of the University of Texas School of Medicine, Galveston, has been appointed a member of the American Board of Plastic Surgeons.

Dr. George L. Nesrsta, Ozona, has been elected Health Officer of Crockett County.

It is reported that 142 physicians of Houston are now serving in the armed forces of the United States and it is estimated that 70 more will enter service before the end of the year.

Dr. W. L. Cooper, Childress, and Miss Mary Leda McAdams were married recently.

Dr. Alvin Baldwin, Jr., Dallas, and Miss Vivian Prideaux were married recently.

Dr. Sam Cunningham, Gainesville, and Miss Betty Sue McMillin were married recently.

Dr. Denman Hucherson, Lufkin, Captain, Medical Corps, U. S. Army, and Miss Gladys Echols were married recently.

DEATHS

Dr. William Saunders Baldwin, Dallas, aged 78, died recently of pneumonia and heart disease.

Dr. E. T. Clark, Lufkin, aged 69, died recently of uremia.

Dr. Sam T. Dowda, Abilene, aged 66, died recently of a heart attack following influenza.

Dr. J. E. Dodson, Vernon, aged 66, died recently of coronary thrombosis.

Dr. P. C. Funk, Bridgeport, aged 82, died recently of cardiorenal vascular disease, senile.

Continued on page 60

BILE ACID THERAPY

In Cholecystitis

The intensified flow of thin liver bile produced by Decholin (dehydrocholic acid) encourages removal of inspissated accumulations from the bile passages and facilitates biliary tract drainage. Subjective relief usually follows its administration; not infrequently objective improvement is discernible roentgenologically.

Jenkinson, observing the influence of Decholin in chronic cholecystitis, states: "There was usually a marked improvement of the symptoms following medical management including dehydrocholic acid (Decholin)."[1]

Decholin is contraindicated in complete obstruction of the common or hepatic bile duct.

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Decholin

1. Jenkinson, E. L.: J. A. M. A. 107:755 (Sept. 5) 1936.

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PURITAN DEALERS IN MOST PRINCIPAL CITIES

Continued from page 58

Dr. Gavin Hamilton, Houston, aged 70, died recently of heart disease.

Dr. Oliver Miller Heartsill, Marshall, aged 85, died recently.

Dr. William W. Swartz, Wichita Falls, aged 66, died recently of angina pectoris.

Dr. William George Walker, Houston, aged 63, died recently of cerebral hemorrhage.

VIRGINIA

Piedmont Medical Society has elected Dr. Percy Harris, Scottsville, President; and Dr. E. D. Davis, Crozet, Secretary.

The 1,000 bed Army hospital to be erected east of Staunton will consist of approximately 100 buildings and will have the name of Woodrow Wilson, who was a native of that city.

Dr. Abraham L. Gelperin, formerly of Baltimore, Maryland, has been appointed Venereal Disease Control Officer of Richmond, succeeding Dr. Aaron Wilson Brown, Pocahontas, who resigned recently to enter private practice.

Dr. Paul W. Bowden, Charlotte Court House, Acting Health Officer of Charlotte County, has been appointed Epidemiologist for Richmond.

Dr. Raymond De Van Kimbrough, Norfolk, was recently appointed State Venereal Disease Control Officer for the Tidewater Area.

Dr. Edgar C. Harper, Richmond, State Chief on part-time duty, has been appointed Consultant in the Public Health Service.

Dr. Elizabeth M. Cover, who received her medical degree from the University of Virginia and completed her training at the Woman's Hospital, Philadel hia, and the Graduate School of the University of Pennsylvania, is now engaged in general practice and surgery at Luray.

Dr. Hugh C. Henry, Richmond, Director of State Hospitals, has been appointed Commissioner of Mental Hygiene and Hospitals of Virginia.

Dr. C. W. Rodgers, formerly of Staunton, is now associated with Dr. W. Clyde West and Dr. J. C. McCluer at Alexandria.

Dr. E. G. Gill, Roanoke, was recently elected a member of the Board of Trustees of the City Library. He is also Chairman of the Advisory Board of Health of the City of Roanoke.

Tidewater Victory Memorial Hospital, near Norfolk, a tuberculosis sanatorium completed five years ago and operated with funds raised mostly by private citizens, has been taken over as a State institution.

Dr. F. B. Zimmerman, who recently completed a residency at the Gill Memorial Eye, Ear and Throat Hospital, Roanoke, is now resident at the General Hospital, Louisville, Kentucky.

Dr. Albert G. Schnurman, formerly of Radford, is now located in the Shenandoah Life Building, Roanoke.

Dr. Glenn H. Baird, Assistant Surgeon, U. S. Public Health Service, has assumed duties as Venereal Disease Control Officer of Richmond.

Dr. S. C. Cox, formerly of Kerr, North Carolina, is now a Captain in the Medical Corps at Station Hospital, Camp Lee.

Dr. William L. Taliaferro, Norfolk, was recently promoted to the rank of Captain and is now located with the 51st Medical Battalion, Camp Blanding, Florida.

Dr. Edward M. Holmes, Jr., for several years Director of the Division of Venereal Disease Control of the State Department of Health, has received a commission as Captain in the Medical Corps, U. S. Army, and has been assigned as Venereal Disease Control Officer at Randolph Field, Texas.

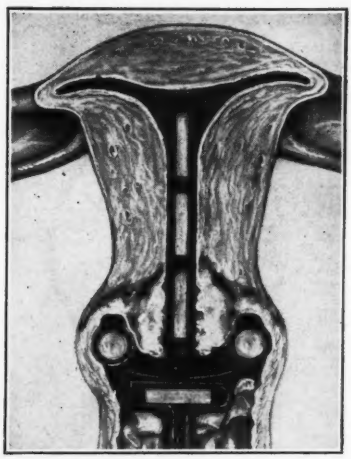
Dr. Daniel Parker Card, Colonel, U. S. Army, Medical Corps, retired, has been appointed Post Surgeon of Virginia Military Institute, replacing Dr. Hunter McClung, Jr., who is in active service with the Army Medical Corps.

Dr. Percy G. Hamlin, a graduate of the Medical College of Virginia, Richmond, and who practiced in Virginia for a number of years, has been promoted to the rank of Lieutenant Colonel in the Medical Corps of the U. S. Army and is located at Camp Ritchie, Maryland.

Dr. Joseph Lee Mann, Lieutenant, Medical Corps, and Miss Nan West Phillips, Hampton, were married recently. Dr. Mann, now stationed at Carlstrom Field, Arcadia, Florida, formerly practiced at Hampton.

Continued on page 62

IMPROVE YOUR RESULTS IN CANCER OF THE CERVIX



CONSISTENTLY high percentages of 5-year cures in Carcinoma of the Cervix are reported by institutions employing the French technique illustrated here. Ametal rubber applicators encase the heavy primary screens and provide ideal secondary filtration to protect the vaginal mucosa. Radium or Radon applicators for the treatment of Carcinoma of the Cervix and provided with Ametal filtration are available exclusively through us. Inquire and order by mail, or preferably by telegraph or telephone reversing charges. Deliveries are made to your office or hospital for use at the hour you may specify.

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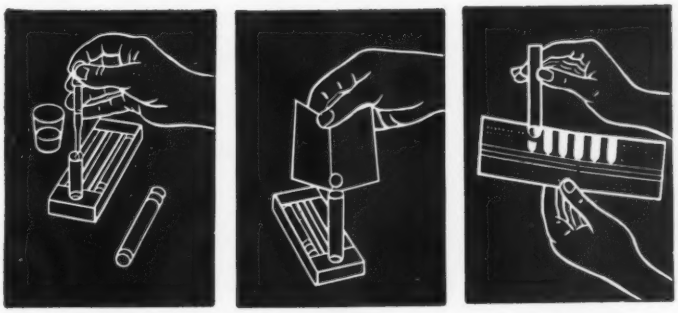
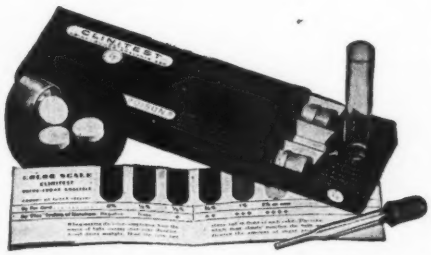


1. 5 drops urine *plus* 10 drops water
2. Drop in tablet
3. Allow for reaction and compare with color scale

DEPENDABLE RESULTS—CLINITEST Tablet Method is based on same chemical principles involved in Benedict's test—*except*—no external heating required, and active ingredients for test contained in a single tablet. Indicates sugar at 0%, ¼%, ½%, ¾%, 1% and 2% plus.



ECONOMICAL TO USE—Complete set (with tablets for 50 tests) costs patient only $1.25. Tablet Refill (for 75 tests)—$1.25.

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EFFERVESCENT PRODUCTS, INC.
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Continued from page 60

Dr. Gray C. Hughes, Martinsville, and Miss Meta Inman, Kingstree, South Carolina, were married recently.

Dr. Phillip Cocke Trout, Lieutenant, Medical Corps, U. S. Army, son of Dr. Hugh H. Trout, Roanoke, and Miss Bettie Ruth Reynolds, Shawsville, were married July 1.

Dr. Charles Edward McKeown, Richmond, and Miss Margaret Parker, Alexandria, were married July 3.

Dr. William Elgin Harman, Floyd, and Miss Elizabeth Jane Hivick, Harrisonburg, were married recently.

DEATHS

Dr. Arthur Blackwell Cosby, Big Island, aged 70, died recently.

Dr. William McCully James, a native of Richmond, aged 62, died in the Canal Zone, July 10.

Dr. Marvin Everett Nuckols, Richmond, aged 65, died July 21.

WEST VIRGINIA

West Virginia University, Morgantown, formally opened its new $150,000 student health center recently. The center is under the direction of the School of Medicine.

Dr. James T. Duncan, formerly of Columbia, Kentucky, is now Director of the Bureau of Tuberculosis of the West Virginia State Department of Health.

Dr. J. E. Cofer, Bergoo, has been elected Secretary and Treasurer of the Central West Virginia Medical Society since Dr. A. B. Bowyer, Elkview, has left for Army service.

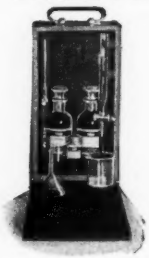
Dr. Wm. D. McClung, Huntington, is now on active duty in the Navy.

Dr. Thomas Paul O'Brien, Benwood, and Miss Jacqueline Weeks, Crewe, were married July 13.

DEATHS

Dr. J. Lincoln Fifer, Buckhannon, aged 80, died recently.

LaMOTTE BLOOD CHEMISTRY SERVICE



LaMOTTE BLOOD UREA OUTFIT for study of urea retention (urea nitrogen by factor). Result is read directly from special Urea Burette supplied. No calculations required. Accurate to 4 mg. urea per 100 c. c. blood. Complete estimation takes only 15 to 20 minutes. Price, complete with instructions, $18.50, f.o.b. Baltimore, Md.

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MEAD'S BREWERS YEAST TABLETS • Each Mead's Brewers Yeast Tablet contains not less than .06 mg. thiamine (vitamin B_1), .02 mg. riboflavin (vitamin G), and 15 mg. nicotinic acid, together with other factors of the vitamin B complex commonly occurring in brewers' yeast.

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1. McEachern, D.: *Canadian Med. Ass'n. J.*, 45:106, 1941.
2. Lennox, W. G.: *Med. Ann. Dist. Col.*, 10:461, 1941.

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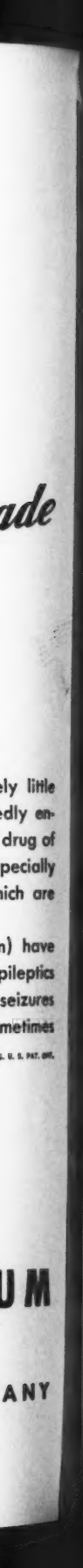
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